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THE AUTOMOBILE

Owners Awakening to Body Needs

A Place for Apparel Is in Brisk Demand

Sentiments voiced by many readers of The Automobile *are distinctly in favor of definite lines of thought founded upon the necessity of providing certain conveniences that are not found in bodies for automobiles. It seems to be true also that the tires and tools, not forgetting the battery, should be placed inside of the car, and it is the purpose here to show that automobiles may be so designed that there will be a place for everything, even the chauffeur.*

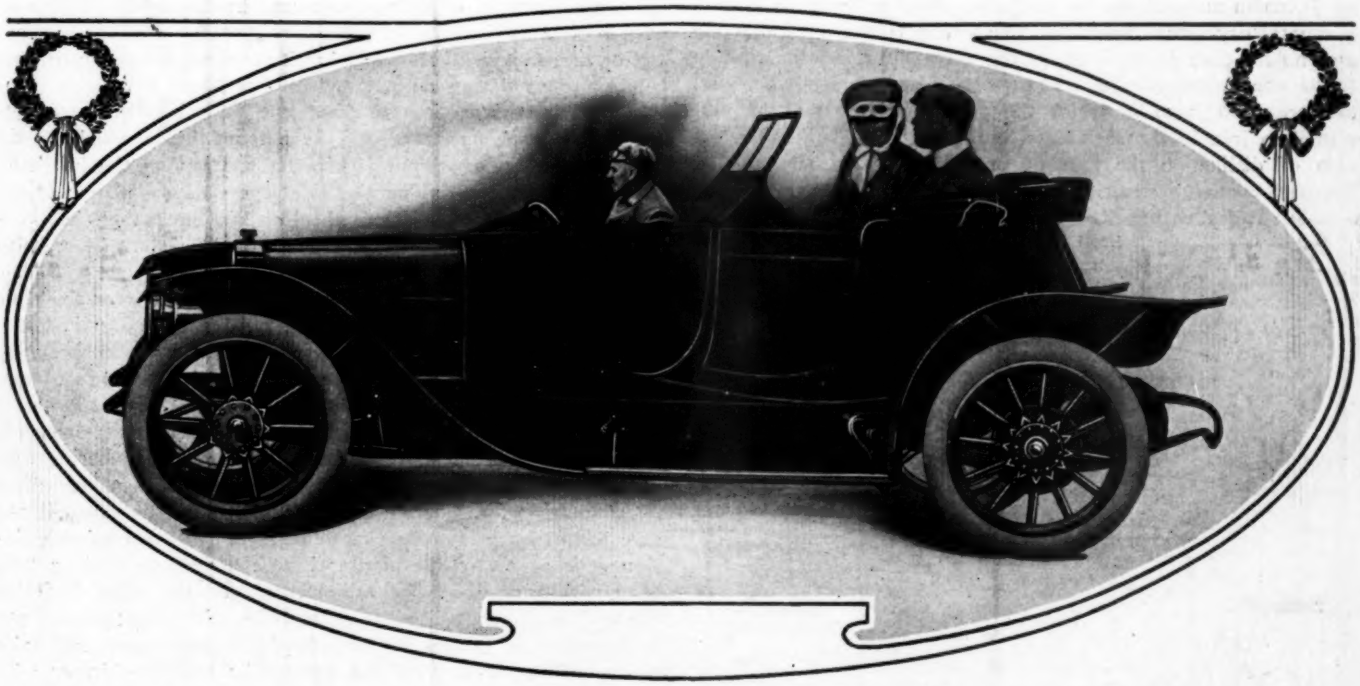


Fig. 1—Side elevation of a new type of automobile body providing a pit for the chauffeur and a separate steering equipment in the tonneau for the convenience of the owner

BODY MAKING, as it applies to automobile construction is an evolution of the carriage-makers' art. Carriages in the old days were not used for touring, due to the fact that horses were incapable of covering distance on a touring basis. The covering of considerable distances by automobilists introduced a new set of requirements, but there is a certain lack of harmony between these new requirements and the manner in which they are being coped with by the men whose experience was founded upon the carriage-makers' idea of the fitness of things. In a recount of the growth of the automobile industry mention would have to be made of the fact that bodies as they were applied to automobiles were lacking in many respects from the point of view of the newer service, and it is to the ingenuity of owners of automobiles that we may trace the practice of loading down the running boards, and the placing of needed facilities at convenient spots over the exterior surfaces of the bodies of automobiles.

In the carriage-makers' time the coachman and the footman had their own domain, and they were provided for according to their needs, and in keeping with a certain ethical situation. When the automobile came into vogue the footman was dispensed with and the coachman was supplanted by a chauffeur, so called, to accord with the newer need. The chauffeur, in addition to directing the movements of the automobile, was supposed to have a certain measure of mechanical skill, and when automobiles first came out it is more than likely that the requirement of mechanical skill greatly exceeded the demand, measuring the capability of the mere driver. When the chauffeur pre-empted the best seat in the body of the automobile, and held it against all comers, the signs of revolt on the part of the other occupants of

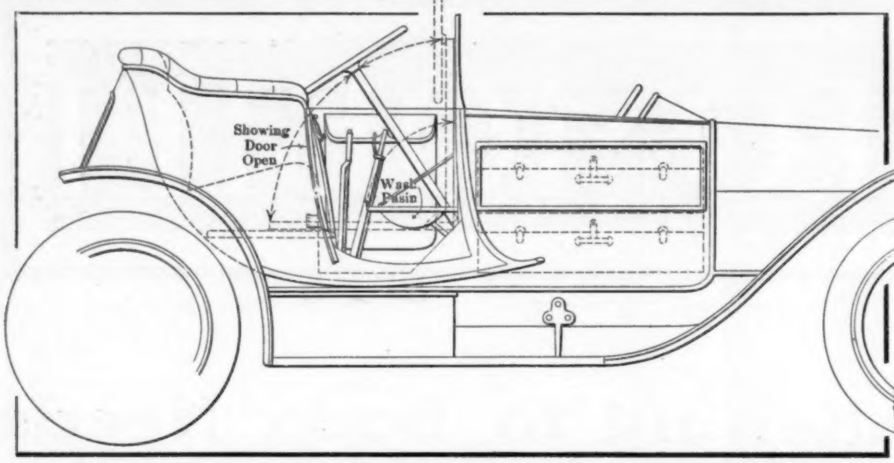


Fig. 2—Right-hand side of the new body, showing the storage of suit cases alongside of the chauffeur, the arrangement of the owner's steering gear in the tonneau, and a folding wash-basin taking water from a tank suitably disposed in the compartment in front

the car were too feeble to attract attention, but a change is coming over the field of automobiling, due to the fact that the mechanical skill idea is no longer a pressing necessity, and as matters stand to-day the best type of chauffeur is represented by the fellow who will have the good sense to keep the automobile clean, replenish the supply of gasoline and lubricating oil, keep the tires inflated, and drive the machine conservatively.

But the chauffeur still sits in the best seat in the automobile, and this fact, instead of being traced to the necessities as they obtained in the past, is the price of lack of ingenuity on the part of designers of bodies, in the face of persistent complaint that is well founded. When the owner of a car invests the best part of $5,000 in an equipage he will have great difficulty in getting a satisfactory return upon this investment if the work that the automobile does is confined to the mere effort of taking him to his office in the morning and back again at night, together with an occasional jaunt in which the owner's family may be permitted to join in the sociability, but there is a distinct expression of dislike on the part of many owners of automobiles, founded upon the experiences of the past, resulting in grease-smeared ladies' costumes and affronted sensibilities, without reasonable ground for objection, since, in all fairness, the chauffeur must be given a place of his own if he is not to occupy a position in the part of the car that is to be devoted to the service of the owner. As a parallel case, the owner of a steam yacht is freed from the objections of contact with the men who work around the machinery thereof, and, for that matter, the engineers who do the work enjoy the advantages of privacy, but this happy situation is at the expense of providing a place for the workmen as well as a place for the owner.

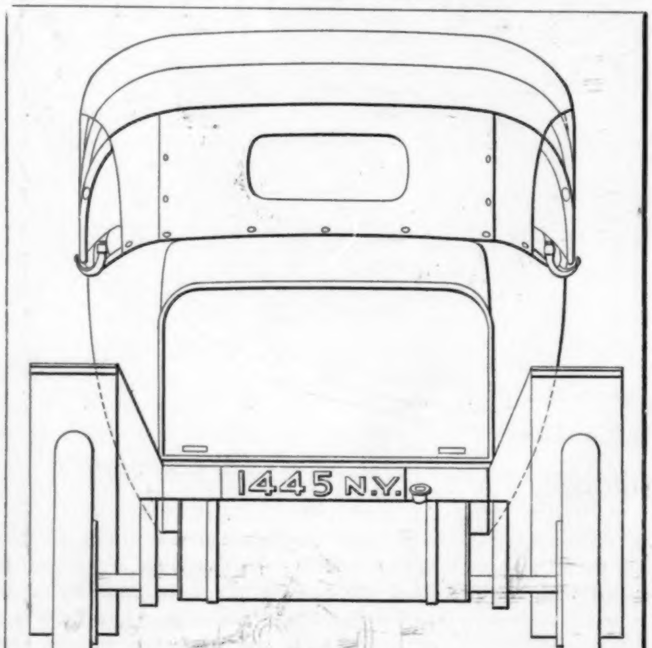


Fig. 3—Rear elevation of the body on a Guy Vaughan chassis, showing the trap door through which access may be had to the tires and tools as they may be stored within

In town car work, since the mechanician has a seat of his own in a position of vantage, those who enjoy the pleasures of this type of car are in a position to voice strong sentiments in favor of the embodiment of the same idea in types of automobiles that may be devoted to long-distance traveling, and it is from this class of the owners of automobiles that the best information comes, they being strongly in favor of providing a seat for the chauffeur and a compartment for the storage of such wearing apparel as must be taken along if a tour is to be under the most pleasurable conditions. When the automobile ranked as a novelty pure and simple there were not so many objections to tourists who might come into the dining-room of a first-class hotel looking like tramps and, to say the least, unkempt; but public opinion is decrying these conditions, and the time will no doubt arrive when tourists will be expected to repair to a room and make a change of costume before appearing in a dining room and in the public parlors of well-kept hostelries.

For the purpose of showing that it is within the realm of possibility to so design an automobile that there will be a place for everything, including the chauffeur, Fig. 1 is offered, presenting the general appearance of the automobile, in which it will be seen that the chauffeur is given a position on the left-hand side of the body, bringing the side levers on the fore and aft center lines, and the steering wheel so low down that the occupants of the owner's seating space would scarcely be able to observe that there is a chauffeur in the car.

The space alongside of the chauffeur is taken up for the storage of suit cases, and a study of Fig. 2 will suffice to indicate the scope of this arrangement, showing two suit cases in the compartment with some space above them for the storage of rugs, coats, etc. Fig. 2 also shows the entrance to the tonneau as it is provided at the right-hand side, bringing into view a new idea which may be briefly described as follows: Remembering that nearly every owner of an automobile has a penchant for driving, and taking into account the fact that the owner would not care to go down into the chauffeur's "pit" in a car of this design, it is a part of the plan as here contrived to equip a tonneau with a master wheel, side levers and the other facilities essential to the control of an automobile, with a means whereby the owner can unship the chauffeur's steering gear and take charge of the driving of the automobile without further ado.

A Place Is Made for the Storage of Tires and Cases, Also for Tools

When the owner gets tired of driving he may reship the chauffeur's gear and instruct him to undertake the responsibility of driving. In order, however, that the steering column as provided for the owner in the tonneau might not prove discommoding in certain respects, it is provided with means and mechanisms for folding back out of the way, thus leaving it entirely optional with the owner of the automobile to drive or not as he wills, or to remove the evidences of his driving facility and take advantage of the extra space afforded thereby.

The back of the car is shown in Fig. 3 with the gasoline tank

attached to the chassis frame, and the license number with means for illumination at the back taken care of as a part of the design of the automobile. Referring to Fig. 4, which is a plan and elevation of the new design, it will be seen how two spare cases are stored in a compartment within the body lines above and slightly to the front of the rear axle with access to these cases through a trap door at the back of the body. In addition to the storage of cases in the back compartment there is room for tools and the design contemplates a definite position for each tool required, and a method of fastening the same into its place so that it cannot go adrift or make noise. Moreover, the arrangement is such that the owner of the car can see at a glance if there is a single tool missing from the kit. With the tires and tools provided for in the back compartment and a Yale lock on the trap door, nothing is left to chance in this quarter, and a considerable measure of the touring responsibility, especially of the harassing sort, is done away with. The space at the front on the right-hand side for the accommodation of two suit cases provides for a regulation size of cases 9 inches deep, 18 inches wide by 33 inches long; this space is dust-proof, and suitably lined with means for fastening the cases down so that they will not rattle and become chafed. In addition to the provision for suit cases and the storage of rugs and coats a water-tank is provided and a folding water-basin is also fitted into place with means for opening the same back into the tonneau. This basin is shown in the open position in Fig. 2, it being contrived in substantially the same way as the folding basin of this character in Pullman compartment cars. In the illustration Fig. 4 provision is made for a searchlight, the latter being back of the dash line, convenient to the chauffeur, with means for hand-control. It is the idea in connection with this body to use electric lights with a dynamo for generating the electric current, suitably attached to the automobile motor. It would be optional to use the searchlight; it may be removed at will, and Fig. 1 shows the body in elevation with the searchlight removed.

Motor Laws in New Brunswick—The New Brunswick Legislature has enacted some laws which are of interest to automobilists who reside in or drive through that province. Here are some of the stipulations: A chauffeur's license may be canceled after two convictions. A higher standard of brilliancy of lamps is necessary. Car numbers must be 4 inches high, instead of 3 inches, as formerly. The motor car speed has been reduced to 20 miles per hour. Some members of the Legislature from the country districts introduced resolutions of a decidedly freakish nature, one of which demanded that cars should not be used on one day in each week. The amendment was shouted down. A tax, which will be given over for the improvement of the roads of the province, was approved, this tax ranging from \$5 to \$25 on automobiles of from 25 to 50 horsepower.

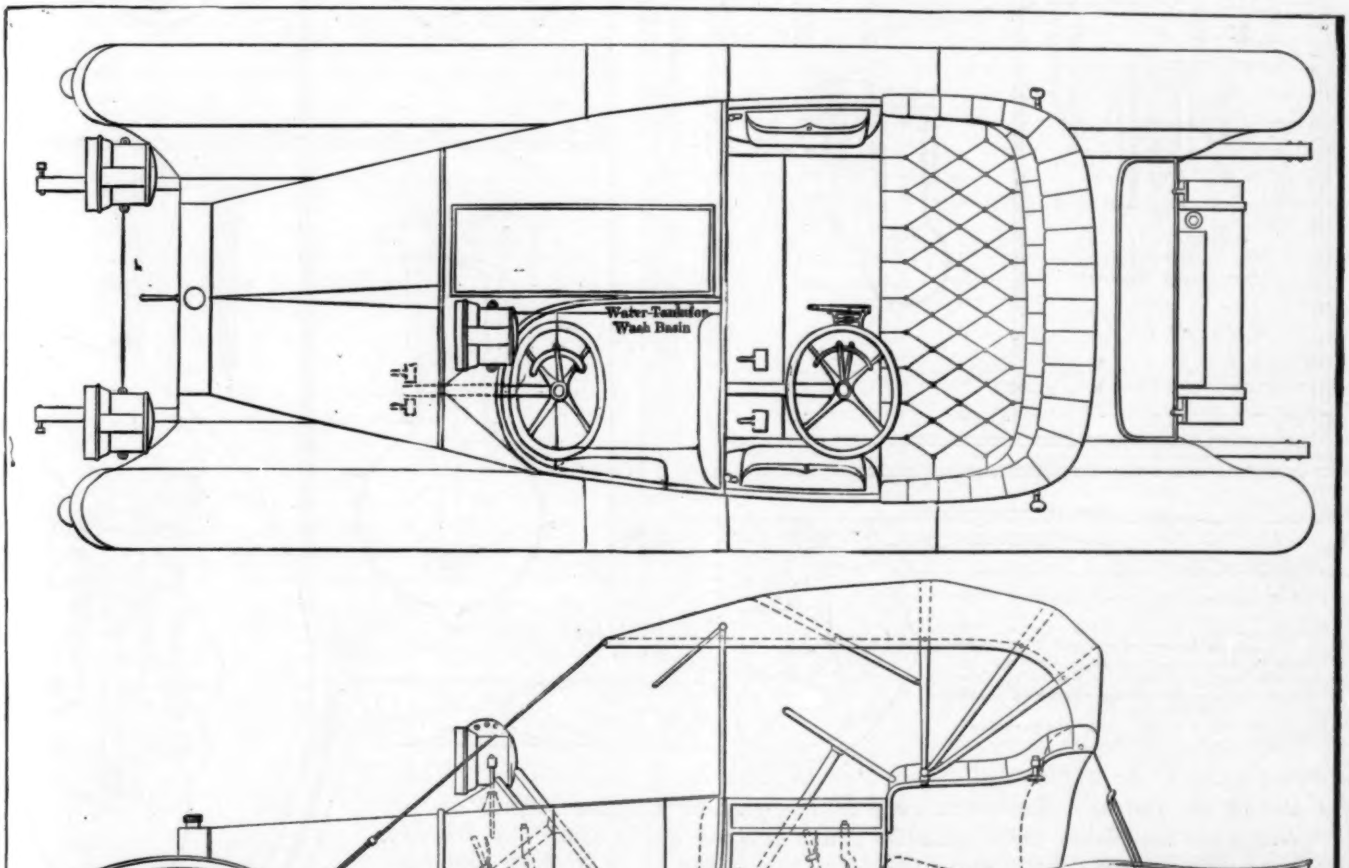
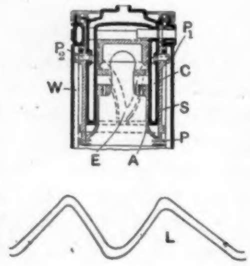


Fig. 4—Plan and elevation of the new body, showing the double steering equipment in dotted lines, also the storage of tire cases. The sealed compartment for suit cases is at the right of the driver's pit

A Deluge of

Is Coming From



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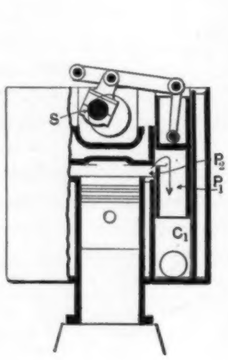

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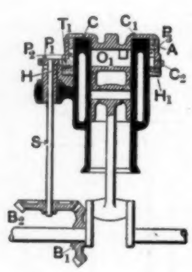

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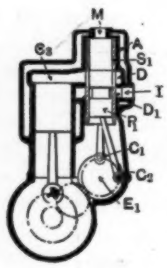
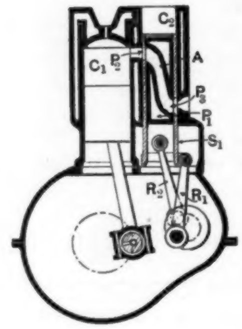
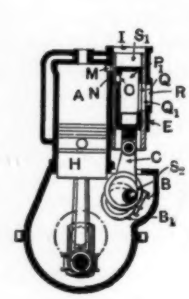


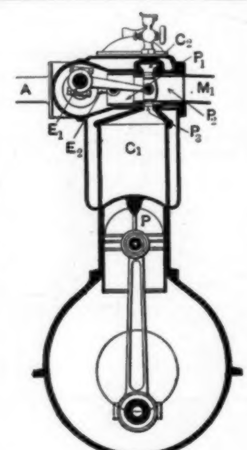
A A



A B



A C



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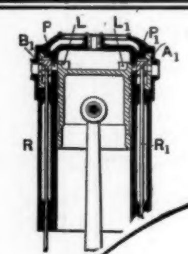
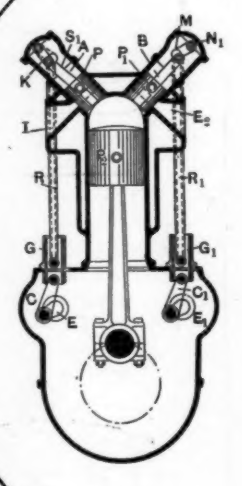


A E



A I

X—Parker sleeve valve motor, showing mechanism
Y—Reader rotary sleeve valve motor with sleeve in cylinder head
Z—Bingham piston valve motor, showing section through head and means of operating valve
AA—Starr motor with piston operating intake and exhaust flow
AB—Scaife valve motor with piston valve
AC—Watkins motor operated by sleeve and piston

AD—Drummond and Bostock motor, showing operation of piston valves
AE—Cylinder of Wridgway motor showing method of operating sleeves
AI—Royce valve motor, showing overhead piston valves

The files of the Patent Office are storing at the present moment several worthy ideas upon the sleeve valve situation which will no doubt some day fructify. Some of the types here presented have passed the stage of trial and have become commercialized propositions. In the following treatise the piston valve has been dealt with in various forms as it has appeared, besides showing several designs of external sleeve motors.

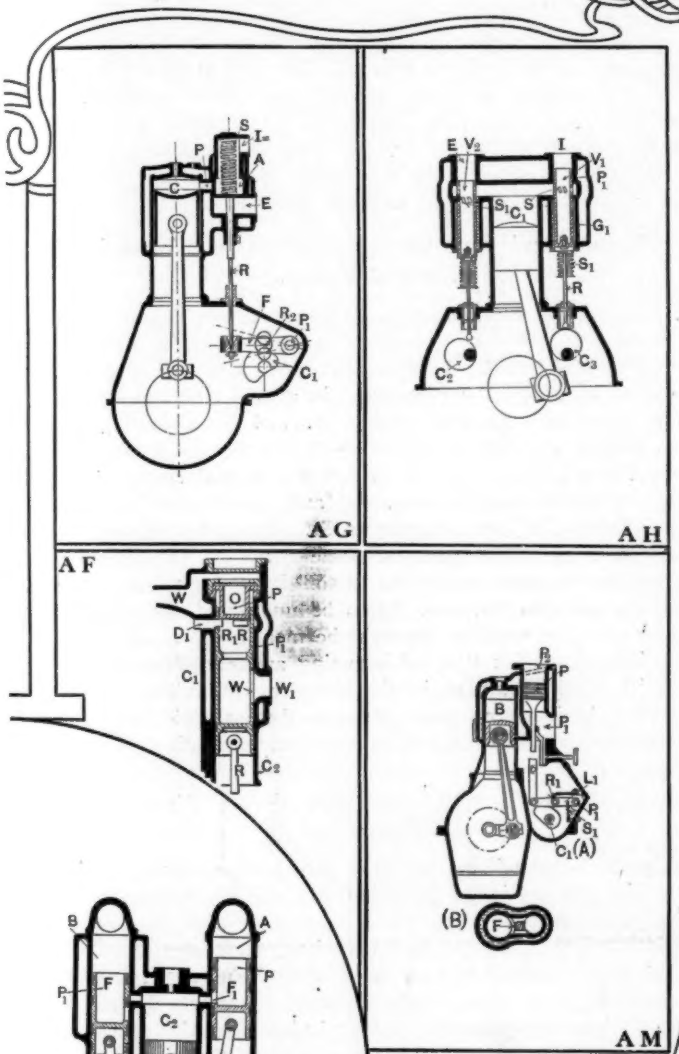
THE various methods of operating sleeves for gasoline motors described in the last number of THE AUTOMOBILE dealt more particularly with such types where either the sleeve or sleeves were caused to reciprocate or rotate. Many of these motors have long since passed the experimental stage, but as in the case of all inventions pioneer work is very slow.

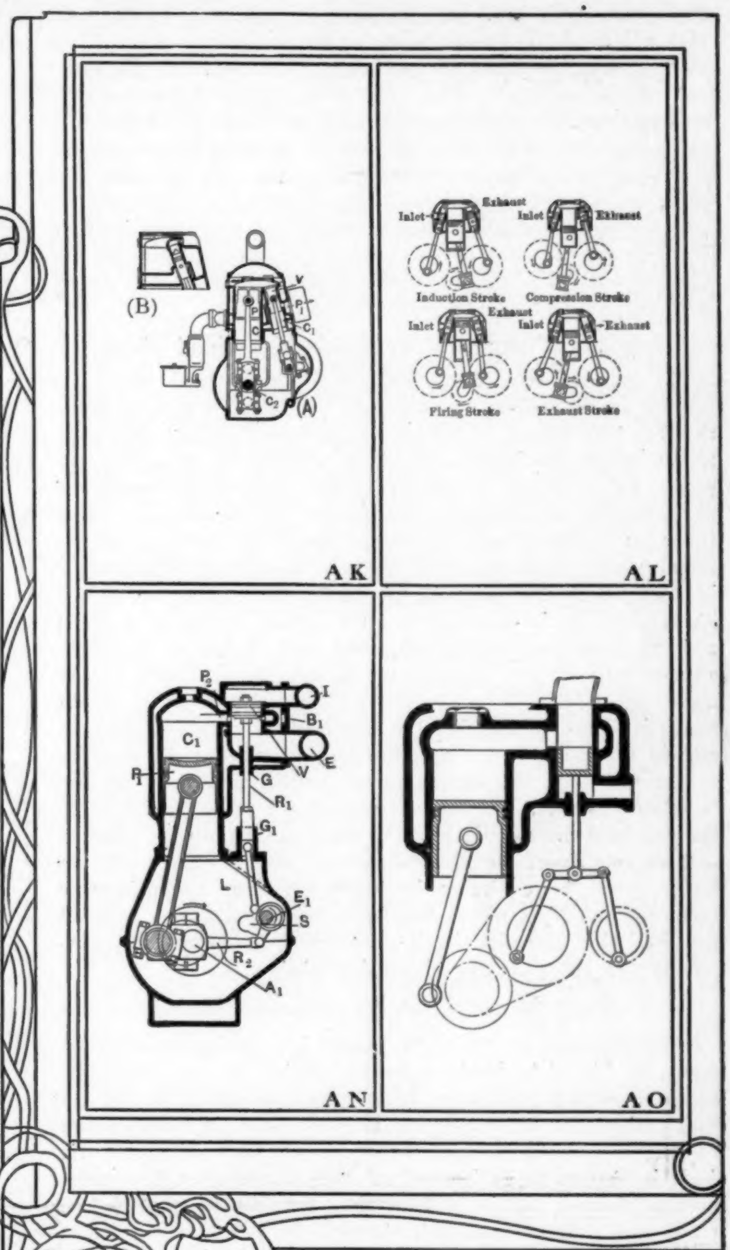
Parker Uses a Somewhat Complicated Method

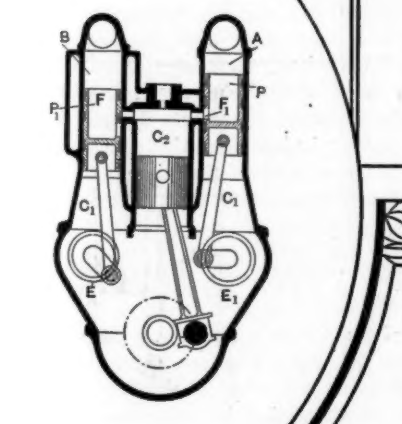
The section of the Parker motor, Fig. X, shows a cross-section of one of the cylinders in which A is the working piston and B the outer sleeve which is placed between the external

Sleeve Motors

Every Nation







AJ—Bingham motor with piston valves, operated directly from below
AK—Section of Hewitt piston valve motor
AL—Diagram showing cycle of operations of Hewitt piston valve motor
AO—Section of Pieper piston-valve motor
AM—(A), Smith single-piston valve motor. (B), plan section of Smith motor, showing working and valve cylinders
AN—Mann piston valve motor shown, single piston for intake and exhaust

AF—Section through valve in Foster motor, showing port
AG—Section through Brindley motor, showing method of operating piston valve
AH—Mascord motor utilizes two cylindrical sleeves placed parallel to working cylinder

wall and the water cooling space C. At the base of the piston P the working piston and the sleeve are joined together so that with the reciprocating motion of the piston A the sleeve is forced to reciprocate as well. The semi-rotary action of the sleeve is obtained by fitting the sleeve with a pivot P1, which engages in a slot in the exterior wall W. The slot is indicated by dotted lines with a lower apex at E. The longitudinal section L shows how the wall W is slotted in order to accommodate the pivots P1 and P2. It is a question whether the power required to guide the pivot in the slot will not take away from the general efficiency of the motor.

Reader Motor Employs Rotary Valve in Head of Motor

Another form of rotary sleeve valve motor is shown in Fig. Y, being the composite production of F. J. Reader, A. E. Taggard and E. A. Wilderspin. The mechanism consists of a rotary valve A which surrounds the cylinder C, the valve having a port or ports adapted to register in rotation with the inlet and exhaust ports of the motor. The valve A at the outer end of the cylinder C surrounds the cylinder; the rotary motion is imparted by

bevel gear set B1 and B2 and thence by a vertical shaft to the pinion P1. This pinion is clean on the upper end of the shaft S and meshes with the teeth T1 formed on the lower end of the valve A. The cylinder C1 has a downward protruding flange C2 which surrounds the valve A, so that the main part of the valve lies within an annular space between the flange and the cover of the cylinder. Adjustable lock nuts are provided on a screwed portion of the cylinder for adjustment of the valve ring, and ball races H and H1 are interposed between the lock nuts and the lower edge of the flange. Ports P2 and P3 are provided in the valve ring A which uncover the cylinder ports O1.

Bingham Piston Valve Motor Has Good Points

The adaptations of the sleeve are legion and at a later date further applications of this type will be given. A type of motor that has been placed on the market commercially and which deserves more than passing mention is what is known as the piston valve motor. This school has several adherents and the methods of operating the piston are numerous. Some favor an overhead motion, others using the conventional eccentric shaft. One type that has been practically demonstrated in England is the Bingham piston valve. As shown in the illustration this is operated by an overhead eccentric shaft S1 and is rotated at one-quarter crankshaft speed, as the rectangular ports in the valves open to the cylinder ports on the down stroke as well as on the up stroke. A section of the motor is shown in Fig. Z. The piston P1 is caused to reciprocate in the cylinder C1, covering and uncovering the port P2 of the cylinder. During the power stroke the valves are not in lateral balance, and the surface of the valve subjected to the explosion pressure is equal to the area of the port. But as will be seen from the illustration the valve is very long; the thrust from the explosion is distributed over a considerable surface area. This motor has been modified in some respects and the valve operation has been effected by means of a connecting rod operating the piston from below.

Starr Motor Uses Sleeve and Piston

In the Starr motor the valve mechanism consists of a sleeve, shown in Fig. AA, inside a small cylinder A, and inside the sleeve there is a piston P1, both being operated from the eccentric shaft E1 by connecting rods C1 and C2. The piston P1 has 90 degrees advance of the sleeve S1. The eccentric shaft is driven at half speed of the crankshaft. The combustion chamber C3 is brought into communication with the intake and exhaust manifolds through the office of the sleeve S1 and the piston P1. The exhaust manifold is attached at M, and the intake I is provided with an annular cavity D and another cavity D1. As the sleeve S1 is drawn downwards the piston P1 moves upwards, and gives free entry to the intake. In a similar manner the upward motion of the sleeve S1 and the downward motion of the piston P1 the upper half of the piston uncovers the port slot and gives free egress to the exhaust.

The Skaife Motor Uses a Channel Piston As Well As a Sleeve

The Skaife motor is shown in section in Fig. AB and alongside the main cylinder C1 there is a cylinder C2. The sleeve S1 is operated by the connecting rod R1 set at 90 degrees to the connecting rod R2 which operates the piston P1. The eccentric shaft runs at half speed and the operation of intake and exhaust is similar to the preceding type with the exception that the intake is effected in the manner shown in the illustration. The piston P1 has a double-elbow passageway which connects the ports P2 and P3. As the sleeve mechanism is housed with the crankshaft no supplementary lubrication is necessary.

Watkins Motor Is Well Thought Out

Fig. AC is a cross-section of the Watkins motor (British Letters Patent No. 650). The valve cylinder E at the side of the working cylinder A contains a sleeve S1 which is adapted to reciprocate therein. The sleeve is operated by eccentric rods B and B1 which are mounted on the half-speed shaft S2 by means of sheaves. The half-speed shaft is driven in the usual manner by gear wheels. Fitted concentrically inside the sleeve valve S1 is the piston valve P1 adapted to reciprocate within it, being operated by the connecting rod B. M is the port opening into the working cylinder A. N is the port in the outer piston valve S1 communicating directly with the port M. O is the port of the piston valve P1 registering with the port N. I is the intake manifold connection. The port Q of the piston valve P1 and the port Q1 of the piston valve S1 are always open to the exhaust port R. The section of the motor shows the relative positions of the two piston valves and their ports on the working cylinder. The working piston H is at the bottom of the stroke, following the explosion stroke, and the ports N and O have just opened to allow the exhaust gases to pass through to the exhaust outlet R.

The Bostock and Drummond Motor Is Controlled by Horizontal Pistons

In the Bostock and Drummond motor, shown in Fig. AD, it will be seen that the piston valves are operated horizontally in the head of the cylinder C1. A is the inlet manifold connection to which the carbureter is attached and the illustration shows the eccentric shafts E1 and E2 operating the valves P1 and P2. The piston valve P1 is slotted and the same applies to the piston valve P2 so that the port P3 in the head of the cylinder becomes uncovered and allows the incoming gases to be sucked into the cylinder C1. It will be noticed that the piston P is of the spherical dome type. As the piston P rises on the exhaust stroke the piston P2 recedes inside the sleeve P1, allowing the port P3 to be uncovered and the exhaust gases to be expelled through the manifold M1. In order to facilitate the quick flow of incoming and outgoing mixture the cavity C2 is provided in the cylinder head. The sleeves are cooled by incoming gases through the manifold way, but this may have a detrimental effect upon the lubrication of these parts.

Sliding Block Sleeves Are Used on the Wridgway Motor

The construction of this motor is clearly shown in the illustration Fig. AE and is the invention of C. G. Wridgway. Two sliding blocks operated by rods R and R1, which are caused to reciprocate by a double eccentric shaft, open and close the ports P and P1, according to the four-cycle principle. As in most motors, there is a certain amount of pressure upon the sleeves during the explosion stroke. It has been the endeavor in this motor to overcome this by extending the piston head into two lobes L and L1, and the position that these occupy is shown in the illustration.

Foster Uses Separate Piston Valves for Intake and Exhaust

In the sectional elevation of the Foster motor, as shown in Fig. AF, this motor is of the single-acting piston valve type, the valve P1 in the axial line showing a portion of the working cylinder C1. The cylinder C2 of the valve is water-jacketed as shown; the port D1 leads from the combustion chamber to the piston valve. P is a stationary piston fitting within the upper part of the reciprocating valve P1. The interior space O inside the hollow stationary piston P is open to the water jacket W. The connecting rod R is operated through an eccentric shaft running at half engine speed. The valve P1 controls either the outlet of the exhaust gases or the inlet of the new charge. The port W of the piston valve is always open to the outlet port W1 in the valve cylinder wall. The ports R and R1 are placed around the valve instead of on one side only, and in the position shown in the illustration the valve is fully opened.

Brindley Adds Complication to Present Practice

In Fig. AG will be seen a motor designed by John Brindley, the principal points of difference between this and other piston valves being that springs are used and the reciprocating motion is obtained through the employment of cams. The piston valve A is operated by a push rod R, which in turn receives its motion from the fulcrum lever F. This is attached at one end to the pivot P1. Within the lever F there is a roller R2 which contacts with a cam C1, and as this is rotated by means of intermediary gearing the piston valve is caused to reciprocate. The spring S holds the roller R2 in contact with the cam C1 so that on the downward stroke the roller follows the cam formation. As the roller passes over the hollow of the cam the valve A uncovers the port P and allows the gases to be sucked through the intake manifold I into the cylinder C. The upward motion of the piston valve again uncovers the port P after the explosion stroke and allows the exhaust gases to be emitted through the exhaust manifold E. The motor works on the ordinary four-cycle principle. One point about the disposition of the exhaust manifold and the relation of the piston A1 is that the gases pass through the port P, while the valve A is entirely out of the line of trouble.

Mascord Utilizes a T-Shaped Cylinder with Two Valves

The accompanying illustration Fig. AH shows a sectional cut of the Mascord motor, in which the valves are provided on either side of the cylinder C1. The valves V1 and V2 are operated by cams C2 and C3. The inlet valve V1 is a cylinder closed at the lower end, and having its upper extremity fitted with piston rings, P1. The lower part is closed and is connected to a rod R. A gland G1 surrounds the lower part of the cylindrical valve, by which the pressure for one or a number of split packing rings may be adjusted, so as always to maintain a gas-tight joint between the lower part of the casing and the lower part of the cylindrical valves. A spiral spring S1 is mounted between the gland and the boss on the rod R1, maintaining uniform pressure. The intake manifold is attached at I, and the exhaust at E. The slots S and S1 in the cylindrical valves allow the gases to pass through them into the respective manifolds.

Royce Favors Overhead Piston Valve

The section of the motor shown in Fig. AI is of the design of Royce, manufacturer of the Rolls-Royce car in England. Two overhead pistons are employed, P and P1, working in cylinders A and B, located on the right and left-hand side of the combustion chamber. The pistons are provided with piston rings and are operated from eccentric shafts E and E1 through connecting rods C and C1, vertical push rods R and R1 and a link motion L. The piston valves work at half speed of the crankshaft. The shaft S1 lies in the center line of the auxiliary cylinder A so that at the time of the explosion vertical pressure is transmitted to the lever system. The operation of the engine is as follows: After the piston P2 has reached the top dead center, the piston sleeve A opens the inlet port I, keeping it wide open during the suction stroke, and closing it at the beginning of the compression stroke. The levers S1 and K then take dead-center position in the auxiliary cylinder at the moment the explosion takes place. After the working piston P2 is about to reach the lower dead center the sleeve P1 opens the port E2 and the exhaust gases are expelled. To add greater rigidity to the lever system the connecting rods C and C1 and rods R and R1 are connected to a cylindrical guide. The lever M is placed externally to the axis N1.

Another Adaptation of the Bingham Motor

In Fig. Z the method of operating the Bingham motor was shown, with an overhead eccentric mechanism, but in Fig. AJ, which is a section of another type of Bingham motor, the sliding piston valves are operated from eccentrics placed in the crank chamber. The auxiliary cylinders A and B are located laterally in respect to the main cylinder. The pistons P and P1 are operated by connecting rods C and C1 from the eccentric shafts E and E1. The pistons are fitted with piston rings. The pistons' valves have slots F and F1 cut in them which communicate with the two ports in the head of the cylinder C2. The explosive pressure in this case is not taken by the actuating levers, but by the surfaces of the piston valve. Lubrication of this type of motor is very simple, as the auxiliary cylinders are in direct communication with the crank chamber.

Hewitt Piston Valve Motor Has Been Used Commercially

The Hewitt motor shown in section in Fig. AK differs from other motors of the piston-valve type, as will be seen from the accompanying illustration, inasmuch as the auxiliary cylinder is placed at an angle instead of parallel to the main cylinder. The four-cylinder motor of this type is cast in pairs, and presents somewhat of a square shape. The inlet and exhaust piston valves are situated together on the left-hand side of the motor. The illustration shows the main piston P in the working cylinder C and alongside it the auxiliary cylinder C1 with its piston V. These valves are operated by connecting rods from a secondary crankshaft driven by gearing from the main crankshaft at half speed of the latter. There are eight valves in all, four exhaust and four intake. Referring to the illustration, the form of the combustion chamber will be noticed, and upon the firing stroke the pressure of the explosion moves the exhaust valves three-fourths of their outward stroke until the piston V uncovers the port P1, thereby delivering power through the half-time gear wheel to the main crankshaft C2, which will correspond to an increased expansion of the charge of approximately 20 per cent., but deducting the low efficiency of the half-speed lay crankshaft, the net increase of power should be in the neighborhood of 10 per cent. The cycle operations of the valves of this motor are shown in Fig. AL, the valves being placed on either side of the working cylinder for simplicity only. Fig. (B) in Fig. AK shows a cross-section through one of the intake valves.

Single Piston Is Used on the Smith Motor

Fig. AM (A) shows the manner of operating the piston valve of the Smith motor by means of a camshaft C1 and a lever L1 which is fitted in one extremity to a pin P1, and a roller R1 contacts with the cam. The roller is held in contact with the cam by means of a spring S1. The piston valve P is moderately moved from the path of the exhaust gases during the exhaust stroke and works in a water-jacketed cylindrical valve chest, controlling a single admission and exhaust port B. During the suction stroke the combustible mixture is admitted to the working cylinder by the upward movement of the piston valve P which uncovers the port B to the inlet port P1. Upon the completion of this stroke the piston valve has attained the position shown in the illustration. At the beginning of the exhaust stroke piston valve P descends and uncovers the port B, thus permitting the exhaust gases to be driven out to the port P2. The lower inner face of the port B at the end adjoining the piston valve chamber is made higher than it is at the other end next to the working cylinder, in order that the exhaust gases passing through the port may be deflected upwardly away from the end of the valve. In order to accommodate the rings with a good fit on the piston valve P the metallic bridge F is formed of the valve cylinder. This prevents the ring of the piston valve from entering the port. The bridge is hollow, and its interior is in direct communication with the water cooling system in order to maintain it at a uniform temperature. This is shown in (B) of Fig. AN.

A Simple Adaptation of the Single Piston Valve

The sectional cut of this motor, which is the invention of Henry Berry and G. H. Mann, shown in Fig. AN, works on the conventional four-cycle stroke. The working cylinder C1, wherein

the piston P1 which has a concave dish reciprocates, has a port P2. The valve box B1, containing the inlet opening I and the exhaust opening E, is fitted with a single piston valve V carried on a rod R1 capable of sliding in guides G and G1. The lower end of the rod R1 is connected by means of a pivoted link L to the shorter arm of the bell crank lever strap S situated on the eccentric E1. The eccentric shaft is coupled up to the engine shaft by a rod R2. By this means the valve V1 is caused to reciprocate in the valve box B1 and alternately place the intake and exhaust ports in communication with the cylinder.

Pieper Piston-Valve Motor Uses Novel Method of Operating the Valves

The valve consists of a piston which slides up and down so as to put the cylinder port B in communication with either the inlet passage C, as shown in Fig. AO, or with the exhaust outlet D. It has been the object of the inventor of this motor to do away with cam operation, and in order to obtain a rapid movement of the piston A and periods of dwell while the ports are open, the piston valve rod E is connected to a rocker F, one end of which is connected by a link G to a crankpin on a shaft running at engine speed. The other end of the rocker F is connected by a link H to a crankpin on a shaft running at half engine speed, thereby providing a quick opening and closing with a period of dwell when the ports are open.

CAPE BRETON, Canada, people now own 15 automobiles which were made by an American concern with a factory in Walkerville, Ontario. There is an import duty of 35 per cent. on foreign-made automobiles, to which the agent's commission of 20 per cent. is added. The touring cars of the type just mentioned are sold in Walkerville for $875, the outfit including windshield, top and lamps.

What Fuel Costs in Truck Operation

Gasoline and Current in Ton-Miles

Based upon an immense and typical experience in automobile truck operation it is found that the ton-mile cost of gasoline is .0087, lubrication .00304, a total of .01174, while the item of expense for current used in propelling electric trucks is .0317 per ton mile, which, with lubrication at .00086, makes a total cost in this particular of .03256. The two-ton electric and three-ton gasoline cars again demonstrated their economy as against that of the smaller sizes of both types of freight automobiles.

WHEN the business man decides to investigate the proposition of replacing his horse-drawn delivery and transfer service with automobile trucks one of the first detailed items that presents itself to him for solution is the cost of gasoline for the operation of gasoline trucks and electric current to drive vehicles of that character.

If he has been systematic in conducting his horse-drawn equipment and if proper detailed records of costs have been kept he knows exactly what it costs per wagon-mile to transfer his freight for each of a dozen different factors that go to make up the sum total of cost. If he has carried his records a little further he knows the ton-mile cost for operation and also the ton-mile cost for each item of operation.

There are many business men who have kept such records with care, but, of course, the vast majority have not done so, and all that their records will show is the cost of operation on gross figures. A detailed record of this kind would prove exceedingly valuable to the business man who to-day is confronted with the stringent necessity of changing his system of transfer and delivery. It would form a solid basis for comparison with both electric and gasoline trucks that would help him immensely in getting maximum service from his equipment at minimum cost.

But to go back to the subject: The cost of gasoline and current is one of the salient items of truck operation, just as tires, repairs and supplies also bear an intimate relation to the total.

The following article takes up the cost of gasoline and electric current actually used in the operation of 634 trucks, 412 of them being electrics and 222 being gasoline cars. The figures submitted cover four years of operation under actual service conditions. If anything beside the exact truth, the total figures per ton-mile as given here are a shade too high, because many of the trucks used in the illustration have been in service for several years and as a consequence are not quite as economical of fuel and current as the most modern types of freight automobiles may be.

However, nothing that approaches the facts and conclusions of this article in the way of exact data has ever been published on this subject. The average mileage of all gasoline cars considered was 28.3 miles per day, including every day in the year whether in service or not. As a matter of fact they were in actual use a trifle over twenty days in each month, the difference between the actual length of the month and the service being accounted for by holidays and lay-ups for repairs, adjustments and other things as well as the general exigencies of business.

The actual mileage of the gasoline cars on working days or days in which they were used was 42.5 miles. This would give a total of 850 miles a month and 10,200 miles a year. It may be well to note that all the cars could have done more service if they had been pressed to do so.

The sizes of gasoline cars considered as far as freight-carrying ability is concerned were those of 1 1-2-ton and 3-ton sizes. Thus, on a basis of 365 days' work in a year, delivering 28.3 wagon miles, the gasoline trucks delivered an average of 63.67 ton-miles for each day in the year.

Actually, figuring on a basis of twenty days' service in each month, they made 42.5 wagon-miles a day on the average, and consequently 85.62 ton-miles at full capacity.

Now getting down to the cost of gasoline used in furnishing power for these cars, it is shown in the reports of their operation that it cost an average of .0221 per wagon-mile for the fuel used on the three-ton trucks. This would give a ton-mile cost for gasoline of .0074, which was far and away the best showing made in this particular. The wagon-mile cost for gasoline for the three-ton trucks varied between .0199 and .0243, with the average precisely between these two extremes.

Of course all the wagon-mile and ton-mile figures are based upon actual mileages for periods of real service.

With the trucks of one and a half tons' capacity the showing is of a materially higher cost for fuel per ton-mile, although the wagon-mile expense is considerably lower. It was found that it cost from .0147 to .0159 to operate these trucks each mile. The average was .0153. This would give a basis for a ton-mile cost of .01. The average ton-mile cost for gasoline, considering all the trucks used in this illustration, was .0087.

To give some idea of the tremendous number of wagon and ton-miles used in gaining these figures it may be said that 28.3

was the average daily mileage of all the trucks. This would give an exact total mileage per year per truck of 10,329.5 and a four-year total of 41,318, or a grand total of 9,172,596 miles, which is equal to 367 circuits of the earth on its equator. As to the freight-carrying feature, that number of wagon-miles means 20,638,341 ton-miles. At an average cost of .0087 per ton-mile for the gasoline used, the daily cost per wagon would be .553929, and per month $16.64 and per year $199.68, and for the four years $798.72, and for the whole 222 trucks $177,315.84.

It should be distinctly understood that lubricating oil is not included in these figures.

Summed up they show that the three-ton truck is 24 per cent. more economical in the transportation of one ton of freight for one mile than the truck of half its size, and that the general average ton-mile cost is .0087.

In taking up the subject of the cost of current for the operation of electrical trucks it should be constantly remembered that the figures herewith do not take lubrication into consideration in any way. Naturally the electrics are entitled to some consideration and a material credit in this matter, because while there is no similar item regarded in the figures on gasoline truck operation, if it were regarded it would be very much larger for the gasoline cars than for the electrics. The difference is probably as much as .00218 per ton-mile in favor of the electric cars.

The average mileage of the electric cars is 20 per day for every day in the year, and the service is about 20 days a month, the same proportion as was shown for the gasoline-propelled vehicles. Of the 412 trucks tabulated, 209 were of two-ton capacity and 203 of one-ton size. Due allowance must be made for this apparent discrepancy in service because Sundays and holidays are included, and it should be remembered that many of this big array of electrics have been in daily use for many years, the difference being emphatically marked as against modern gasoline cars.

The current cost per wagon-mile for two-ton trucks ranged between .0474 and .0442, considering both acid-lead and nickel-iron equipment. The average cost per wagon-mile was .0458 and the ton-mile cost of current for this type of wagon proved to be .0229.

As compared with the cost of current for one-ton wagons, this showing is remarkable because it has been found that the one-ton truck is far less economical in this respect. The cost was .0406 on the general average for this size of truck, which is not far from the wagon-mile cost of the wagons twice the size. As the smaller trucks were of one-ton capacity, the wagon-mile cost of gasoline is the same as the ton-mile cost.

Thus the average cost for both sizes of electric trucks was .0317 per ton-mile. The average electric truck delivered 30 ton-miles per day, thus the cost of current per day was .9510, which would make $347.115 per year and $1,388.46 for the four years of service, or $572,045.52 for the whole fleet during the four years.

The average monthly mileage for the electric cars being 600, the yearly mileage would be 7200; the distance traveled in the four years per car would be 28,800, and for the 412 trucks 11,865,600. This represents 17,798,400 ton-miles.

Taking a general view of the cost of operating mechanically-propelled freight vehicles the figures here adduced show the following facts: The data considered shows that gasoline trucks delivered 9,172,596 wagon-miles and 20,638,341 ton-miles in four years at a cost of $177,315.84, or .0087 per ton-mile for fuel.

The electrics cost over three times as much for current per ton-mile as the gasoline cars required for fuel. The total number of wagon-miles made by all the trucks was 21,038,196, and the ton-miles involved were 38,436,741. The average cost for gasoline and electric current proved to be .0202 per ton-mile, taking all the cars into consideration.

Experience has shown that lubrication is more uncertain in its costs than gasoline and current, but a fairly exhaustive examination of the field tends to show that the average cost of oil and grease for the gasoline car approximates $70.75 in an average year's running service. This would mean a per ton-mile cost of .00304 for lubrication.

With respect to the electrics it has been found that the average yearly expense for lubrication was only $9.41, which would indicate a per ton-mile cost of .00086. The difference in favor of the electric car on that basis would be .00218 per ton-mile. This may not be precisely the difference, but it is surely within a small fraction of a mill of the actual figures.

On this kind of a foundation the per ton-mile cost of current and lubrication for all the electrics considered in this article would be .03256, and the ton-mile cost of gasoline and lubrication in the gasoline trucks would be .01174.

As has been noted in previous articles on truck operation, the two-ton electric and the three-ton gasoline types were far more economical in operation than those of smaller size when the figures are reduced to a basis of ton-miles. It is only reasonable to assume that this tendency may be carried out with sizes that are materially larger than those used as the foundation of this article. However, actual figures touching upon this feature of truck operation are not yet available, so the theory cannot be said to be proved in practice.

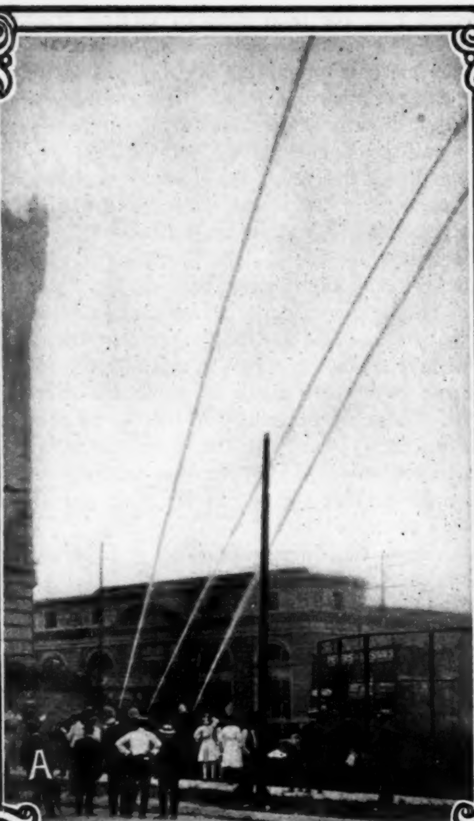
New Fire-Fighting Apparatus

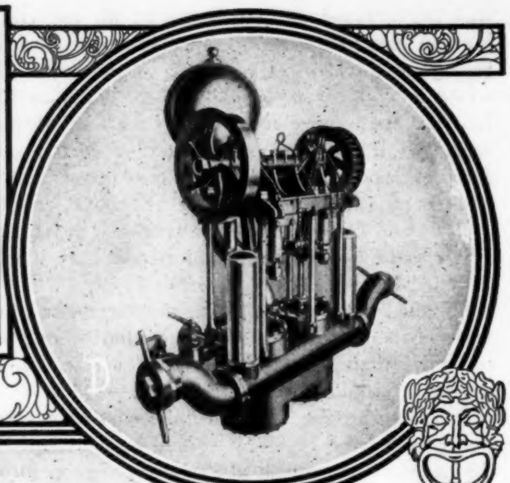
New York City in a Receptive Mood

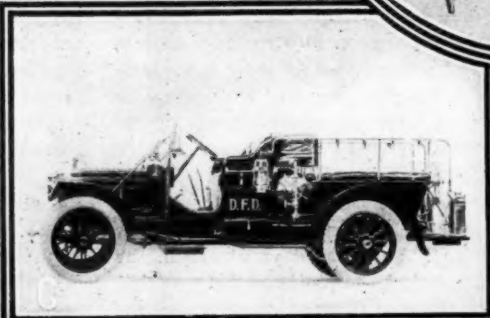
The time is now ripe for the general adoption in New York City of automobile fire engines, and it behooves those who can furnish the apparatus to carefully consider what is required of a system that can replace that which is now in use and has been found capable of fulfilling its office in the vicissitudes of actual service. The day of the specialist is here and this must be remembered in constructing both the truck and the pump.

ROME was not built in a day nor was it built through the brilliant achievements of a lone emperor, general or statesman. The united efforts of those who were foremost in their own particular art accomplished the works of law, art and military science which have been handed down to us. For a wagon maker to try to build a pump which will be good enough to replace the results of years of experimenting and study on the part of those most expert in the science of pump building is as futile as the efforts of our leading pump builders to produce a truck which will supersede the efforts of the specialists in the science of truck building.

A successful fire engine must be as much of a success when it arrives at the point of duty as it was when it was on its way to that spot; and also it must be considered that the best pump on earth is no good to any fire department if it arrives on the scene long past the time when it should have been forcing a flood of water on the fire. The present-day apparatus is not a failure and it is not on such a basis that there is a wild desire to get rid of it and replace it with anything which may present itself; but there is a sane desire to improve it. The automobile has superseded the horse in other lines of work and will no doubt do the same thing in the way of transporting fire ap-







B—Automobile water tower used by New York City Fire Department

C—Packard fire wagon equipped with chemical tank and hose

A—Robinson auto fire engine throwing water from three 2 1-2-inch lines

D—Motor-driven pump on the Knox fire engine

paratus, that is, if the quality of the apparatus is of such a nature as to warrant its use in place of that now employed.

The time is now ripe for such a change. The field is open for the manufacturer who can bring forward a fire engine that will not be the product of either a truck builder or an engine builder, but the combined efforts of the two. To be able to produce such a machine a thorough knowledge of the problem on hand will be necessary, and this knowledge will necessarily consist of an understanding of the policy to pursue to secure a fair trial with a good prospect of the adoption of the machine should it perform in a manner that would justify such adoption and an accurate conception of the requirements in terms of the facilities now on hand. The former will have to be left to the judgment of the manufacturer, while the latter may be partly supplied by a resumé of the situation as it now stands.

The Hydraulics of Fire-Fighting

The fire-engine question resolves itself from the start into two divisions which are entirely independent of each other. The first part of the matter deals with the transportation of the apparatus, while the second has to do with its operation after it has arrived on the scene of its activities. The high-pressure system obviates the necessity of transporting pumping apparatus by centralizing the plants and feeding water directly to the high-pressure hydrants in the various parts of the city.

The capacity of the fire-fighting pump, as well as any other piece of pumping machinery, can best be considered from a gallon-per-minute standpoint, that is, the ability of the pump to deliver a given quantity of water in a given time. The determining points of the quantity of water delivered will be found to be the pressure at the nozzle and the diameter of the nozzle.

In order to deliver the water at a certain pressure at the nozzle, the pressure at the pumping station, whether it is a fire engine, fire boat or high-pressure pumping station, will be entirely governed by the size and length of the hose line and the bore of the nozzle. To illustrate this fact a practical case may be taken: with a required nozzle pressure of 80 pounds, a two-and-one-half-inch hose line and a length of 400 feet, the pressure at the engine or high-pressure hydrant must be 150 pounds, using the best grade of rubber-lined hose and a smooth nozzle one inch in diameter. If, however, the bore of the nozzle were changed to one and one-half inches instead of one inch, all the other conditions being kept the same, for an engine pressure of 150 pounds, there would only be a pressure of 36 pounds at the nozzle. A variation in the length of the line would, of course, affect the nozzle pressure in a similar manner.

Besides affecting the engine pressure, the quantity of water thrown in a given time is naturally directly dependent, for a definite nozzle pressure, upon the size of the nozzle. Any calculations for the quantity of water discharged per unit of time may be worked out by formulæ involving the diameter of the nozzle and the pressure at that point. Such a formula will be given later, after a brief consideration of the fire apparatus now in use in Greater New York.

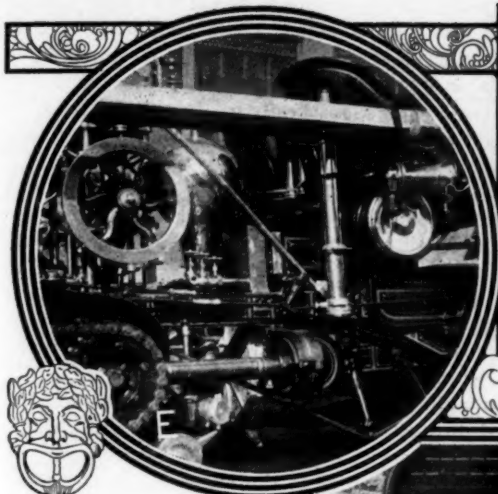
The theoretical range of the stream may be calculated from the gallons per minute of discharge and the size of the nozzle. This, however, is affected to such a degree by wind and other practical considerations, that it is of no real value except, perhaps, as a means of judging the results to be expected.

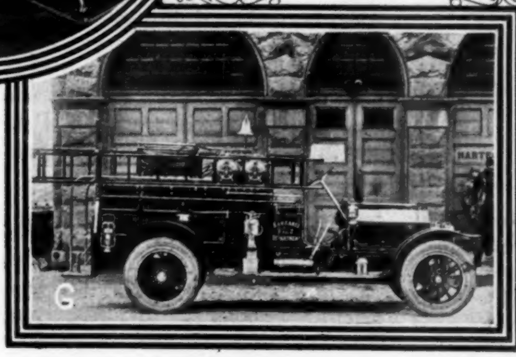
In the boroughs of Manhattan and the Bronx in New York City the largest fire engine pumps in use have a stroke of 9 inches and a bore of 5 3-4 inches. This pump is of a size known as "extra first" and has a reasonable capacity of about 1,000 gallons per minute. To obtain this capacity through different sets of hose lines and nozzles, with a piston speed of about 400 feet per minute, which is about the usual practice under a steady load, the engine pressure will vary with the number and length of lines used and the size of the nozzles.

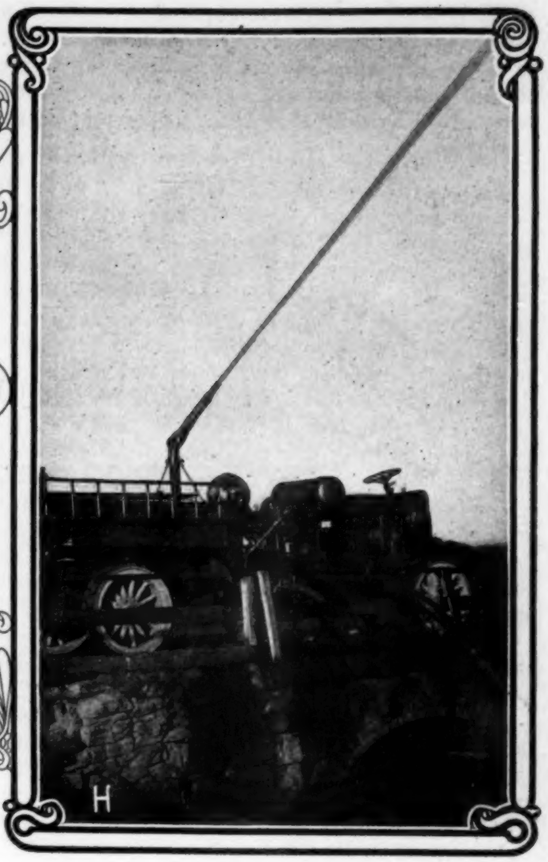
Fire Equipment of Greater New York

In the boroughs of Manhattan and the Bronx there are two of the "extra first" size pumps in use, one with the dimensions given above; the other, while of the same bore, 5 3-4 inches, has a stroke of 8 inches. The reasonable capacity of both these pumps is 1,000 gallons per minute.

Of the remaining 85 steam fire engines in the two boroughs,







E—View of a motor-driven water pump in chassis

F—White gasoline car used as chief's wagon

H—Modern type of automobile fire engine sucking water from a stream

G—Kissel Kar chemical truck

there are 28 of the "first" size, having in the majority of cases a stroke of 8 inches and a bore of 5 3-4 inches. The rest are "second," "third" and "fourth" sizes and range from the size mentioned above, for the "first" size, down to as low as four-inch bore, in the "fourth" size.

In addition to the regular fire engine equipment noted, there are 26 steam engines and seven of the fire fleet. The spare steam engines are distributed about the two boroughs and are kept for emergency purposes.

The boroughs of Brooklyn and Queens are equipped with 81 steam engines and two of the fire fleet. Of the 81 steam engines, 6 are of the "first" size, 15 of the "second" and the remainder of the "third" and "fourth." The stroke and bore of these engines are the same as the stroke and bore of the Manhattan and Bronx engines of corresponding size.

The borough of Richmond has 8 steam fire engines, all of which are of size 4, having a stroke of 6 inches and bore of 5 1-2 inches, with one exception, this pump having a stroke of 7 inches and a bore of 4 inches. The fireboat "Zophan Mills" is included in the Richmond Borough apparatus.

The boroughs of Brooklyn and Queens have 9 spare engines and the borough of Richmond has 3.

Coping with Water-Front Conflagrations

The fire fleet of the marine division consists of ten fireboats which are equipped with pumps. The "New Yorker" is the largest, her pumps having a total capacity of 12,000 gallons per minute. Next in size are the "James Duane" and "Thomas Willett" each with a capacity of 9,000 gallons. The "Cornelius W. Lawrence," "Abram S. Hewitt" and "George B. McLellan" have a capacity of 7,000 gallons while the "Zophan Mills" and "William S. Strong" have capacities of 6,000 gallons per minute. The two smallest are the "David A. Boody" with 5,000 gallons capacity and the "Seth Low" with 3,500. The total capacity of the fireboat fleet is 68,500 gallons per minute.

To give an idea as to how the water is distributed and the methods in use on the fire boats, it may be well to give a short description of representative boats. The pumps aboard the newer boats are of the centrifugal type, while the older boats use the reciprocating form of pump. We will take the "New Yorker," however, as a fair example of the distribution of the water supply on the majority of fireboats now in use, and the "Thomas Willett" and "James Duane" as examples of fireboats using the centrifugal type of pumps. The rating of the two latter boats while not so high as that of the "New Yorker" is probably below the maximum available capacity of the pumps.

The Fireboat "New Yorker" has four duplex pumps each with a free outlet capacity of 3,250 gallons per minute. This capacity is reduced of course, when the outlets are connected to the lines; and becomes about 3,000 gallons per minute for each pump. The capacity of the pumps depends directly on the back pressure caused by a small nozzle or a long line. These pumps are of the reciprocating type and are double acting, the water cylinders being 11-inch stream by 10-inch bore.

There are two currents mounted on the vessel, each being surmounted by a Glazer standpipe. The outlet of the Glazer standpipes can be regulated from 1 1-2 inches up. There are eight 3 1-2 inch outlets on each turrent and one 6 inch.

The lines of hose carried on the three reels, which are placed on the deck, consist of two reels, each carrying twenty lengths of 3 1-2 inch hose, and one reel with sixteen lengths of 2 1-2 inch. These lengths are of the standard size, being 50 feet each, making the total hose carried 1,000 feet of 3 1-2 inch and 800 feet of 2 1-2 inch line.

There is a double supply of hose on hand at the slip which is wound upon reels and ready in case of emergency.

The two new boats, the "Thomas Willett" and the "James Duane," of a registered capacity of 9,000 gallons each, are equipped with two turbine pumps which supply two turrents and a water tower. The two turrents are surmounted by Glazer standpipes, as is also the water tower.

The water tower is a skeleton mast built up with four angle irons and lattice work. There is a 6-inch pipe passing up through the water tower, terminating in the standpipe.

The pumps on this boat are, as has been stated, of the turbine type. It has been found by experience that with this type

of pump when the pressure required at a given fire runs above 150 pounds there will be a very large amount of slip. The pumps in a case of this kind should be staged, allowing the water to be forced from one through the other. The capacity when this is done will be reduced to about 60 per cent. of the available.

Where the High-Pressure System Comes In

In case of the water supply failing on shore the fireboats could take the water directly from the river and deliver it to the engines on land. In Brooklyn there are a number of places along the water front where the fireboats can be connected directly to the high-pressure mains in case of the failure of the water supply or of the pumps in the high-pressure pumping stations.

There are two high-pressure pumping stations in Manhattan and three in Brooklyn. One of the two Brooklyn pumping stations is in Coney Island. The locations are as follows: In Manhattan, one at the foot of Oliver street, and the other at the foot of Gansevoort street. In Brooklyn, one at Joralemon street, one on St. Edwards street and the other at Coney Island.

The two stations in Manhattan and the two in Brooklyn proper are equipped with electrically-driven centrifugal pumps, each one having a capacity of 3,000 gallons per minute. The two Manhattan stations have five pumps each, so that the two stations have a total capacity of 30,000 gallons per minute.

The Joralemon street station, Brooklyn, has five of these 3,000 gallon pumps and the St. Edwards street station has three pumps having a total capacity of 9,000 gallons.

The Coney Island station is driven by gas engines which operate three Goulds triple reciprocating pumps having a capacity of 1,500 gallons per minute each. This gives a total of 4,500 gallons per minute for the Coney Island plant.

In certain districts in Manhattan which are protected by the high-pressure stations the engines are not required to respond to the alarms. They are held in reserve. In Brooklyn, however, the signals are answered by the engines as well as by the hose carts and other apparatus.

The Brooklyn high-pressure stations start with a pressure of 75 pounds and the Manhattan with 125 pounds. This is generally sufficient for a small fire. In the case of a high building or a hot fire which cannot be fought at close range more pressure will be required. This is secured by notifying the pumping stations, which can, if necessary, give as high as 300 pounds. The Coney Island station being smaller will give as high as 150 pounds.

The largest high-pressure mains in Brooklyn are 20 inches, the smallest 12 inches. The hydrant pipes are 8 inches. The largest in Manhattan are 24 inches, the smallest 12 inches, and the hydrants 8 inches. In Coney Island the sizes run from 16 inches to 12 inches, with 8-inch hydrants.

The Question of Water Supply

An idea of the total capacity of the fire-fighting water supply in greater New York may be gathered from the total ratings of the three divisions considered: The steam fire engine, the fire fleet and the high-pressure system. The reasonable ratings of the different size fire engines, according to the National Board of Fire Underwriters, is as follows:

Size	Capacity
Extra first	1,000 gallons per minute
First	900 " " "
Second	700 " " "
Third	600 " " "
Fourth	500 " " "

If the fire engines are figured on this basis the total capacity of the pumping stations of Greater New York is 245,000 gallons per minute:

Manhattan and Bronx	65,000 gallons per minute
Brooklyn and Queens	49,000 " " "
Richmond	4,000 " " "
Fire fleet	68,500 " " "
All high-pressure stations	58,500 " " "
Total	245,000 " " "

This total, of course, is not of practical use and only a small percentage of the whole water supply could be concentrated in one locality. It may serve as a basis of calculation, however, in figuring the available supply of water from a per capita standpoint. The high-pressure mains it must be understood form an entirely independent system, having no connection whatever with the water for domestic service.

Now that we have considered the quantity of water which can be delivered by the three main divisions of the fire-fighting apparatus, that is, the rolling stock, the high-pressure pumping stations and the marine department, perhaps the next thing to take up would be the hydraulic principals involved in delivering the water to the points required and the methods in use by the municipal engineers in calculating the various quantities involved by the problems which present themselves.

Whether from a high-pressure pumping station or reservoir the water is conducted through the streets by water mains of various sizes. The sizes are, of course, governed by the requirements of the particular case. The material of the water mains and pipes in use in New York City is cast iron. The interior of the pipes are coated with a preparation to make them more durable and smoother so as to offer less resistance to the flow of water through them.

The Mathematics of Fire-Fighting

On leaving the pumping station or reservoir the water has a certain head which is utilized in two ways; first to give the fluid a certain velocity and then to overcome the internal resistance of the pipes to the flow of the water. The loss in head due to the frictional resistances of the pipe will vary directly as the length of the pipe line and the condition of the pipe, new pipe offering far less resistance to the flow than old pipe. This fact naturally brings up the old question of the life of cast-iron pipe.

The life of cast-iron pipe is governed by the thoroughness of the coating and the character of the water passing through it. The iron is attacked by the carbonic acid in the water which by a chemical process forms a depression in the pipe in which a little bunch of oxide of iron called commonly a tubercle is built up. Beneath this tubercle a rapid process of corrosion is continually going on. The process of corrosion will start in the most minute imperfection in the pipe coating and for this reason a most rigid system of inspection is necessary before laying the pipe. Well-coated pipe should last fifty years.

The sum of the loss in head due to the frictional resistance in the pipe and the head due to the velocity will equal the total head of the water at the point of entrance to the pipe line.

In figuring the size of pipe required for a particular case the city engineers make use of a table based on two formulæ given by H. Darcy; the first formula for velocities of flow less than 0.33 feet per second, and the second $h = \left(0.0198920 + \frac{0.00166573}{d}\right) \frac{l V^2}{d \times 2g}$, in which H = loss of head due to friction in feet; d = the internal diameter of the pipe; V = velocity in feet per second; l = the length of the pipe in feet; 2g = 64.324; for velocities of flow equal to or greater than 0.33 feet per second. The method of procedure with Weston's tables, which are based on these formulæ, is as follows, for an example of this type: What size pipe will be required to supply Q gallons of water per 24 hours, under h feet head, the point of delivery being L feet from the point of supply, and the point of delivery having an elevation H feet below the head supplied? The loss of head in passing through the line must not be more than (H-h) in order to have the required head of h feet at the outlet. The table shows what size of pipe will deliver Q gallons with a loss of head equal to (H-h) feet. In case two pipes are necessary the amount Q will have to be divided between two pipes. The number of pipes used is as a rule a matter of discretion with the designer. Examples of other types are worked out in a similar way by the

use of these tables. In New York City the ordinary hydrants may have a pressure anywhere from 75 pounds, which is attained in some parts of Brooklyn, down to a merely sufficient pressure to overcome that of the atmosphere. This will, of course, depend entirely on the locality. In designing the supply for a given vicinity the supply is designed to satisfy the requirements of the highest buildings in that vicinity, the amount required being based on previous experience in the supply of similar districts. This information is kept in tabular form.

The pressure on the high-pressure mains varies, as above mentioned, with the requirements of the case. The mains, hydrants, etc. are designed to take care of the maximum. The pipes of a given internal diameter are made in standard weights, the material used generally having a tensile strength of from 16,000 to 18,000 pounds per square inch. Different classes are being designed to meet different pressures and are used as standard weights for these pressures.

The water delivered from the steam engine pumps is calculated from the displacement. Assuming a double reciprocating pump with a stroke $= 1$, bore $= d$, the displacement of the plunger in gallons per revolution would be

$$D = 2 \frac{(d^2 \times 3.1416 \times 2 \times 1)}{4 \times 231}.$$

From the quantity obtained from this formula would have to be subtracted the correction for the volume of the pump rod, as this is a large factor. There is a certain per cent. slip which must be deducted from the displacement in calculating the capacity of the pump. This percentage of wasted power, caused by the water getting past the piston, varies with the pressure and the make of the pump. It is large in the case of centrifugal pumps, there are none of these, however, on the New York steam fire engines in the land service.

The flow of the water through the hose is subject to the same hydraulic principles as the flow through the cast-iron pipes. There is a table published by the National Board of Fire Underwriters and supplied to every fire house which gives the gallons per minute discharged from various diameters of nozzles for any nozzle pressure. This table is for the best grade of rubber-lined hose.

A formula worked out from experiments by the New York City Fire Department expresses the gallons per minute for any case: $Q = \sqrt{p \times d^2 \times 29.7}$. Where $Q =$ gallons per minute, $p =$ nozzle pressure, $d =$ diameter of the nozzle; 29.7 is the barometric pressure.

The following condensed table, showing the flow of water from a standard 8-inch hydrant under different pressure heads, will show capacities for the various pressures:

Head in Ft.	Ft. per min. vel.	Gals. in min.
.02	1.28	200
.06	1.91	300
.10	2.55	400
.16	3.19	500
.23	3.83	600
.31	4.47	700
.41	5.11	800
.51	5.74	900
.63	6.38	1000
.77	7.02	1100
.91	7.66	1200
1.07	8.30	1300
1.24	8.94	1400
1.43	9.57	1500

The Ever-Ready Automatic Starter

The production of an automatic device that will do away with the arduous and unpleasant work of cranking the automobile is as welcome as it is useful in a great number of cases. To have to climb more or less gracefully from the driver's seat to the starting crank of a stalled automobile accompanied by the shouts of a traffic policeman and the maledictions of delayed drivers of wagons and cars is a situation that nobody but the man who has been in it appreciates. This state of affairs becomes all the more acute when the unfortunate happens to be a woman trying to overcome a 40-pound compression with a 30-pound pull.

The Ever-Ready Starter is designed to be of use in starting the motor at any time, whether it be stalled or in starting for the run. It can be attached to any automobile or motor boat and is guaranteed to start the same by a simple pressure on a pedal or lever which releases the brakes which hold the mechanism and automatically cranks the motor.

In appearance the starter is very much like a reversed automobile headlight, being about the same size and of polished brass or other finish as may be desired. It is placed on the front of the car at the point where the starting crank is generally placed.

The operation of starting is performed by two powerful springs which are strong enough to spin the motor for about six revolutions against compression at the rate of about 300 revolutions per minute. These springs are wound up by the motor itself during the first twenty-six revolutions made after the engine has been started. When the springs have been fully wound an automatic release comes into play and disengages the winding mechanism from the driving shaft, leaving the starter ready for the next time it may be called upon to start the motor.

It is, of course, understood that the engine must be in condition to start, the same as if it were to be started by hand. In case the starting spring is released without the spark switched on or some other condition of starting left unfulfilled, the starter will have to be wound by hand. A crank is provided for that purpose and a system of reducing gears makes it very easy to wind up to the proper tension. In case the starter is disabled by collision or through some other accident which renders it inoperative, the front cover can be removed and the regular starting crank which was furnished with the car may be used until the needed repairs are made. The device is guaranteed against defective parts for one year.

Owing to the rapidity with which the engine is turned over in starting, the magneto may be used immediately. There is a device by which the starter may be disregarded and the engine turned over slowly for grinding valves or timing the engine.

One of the greatest arguments in favor of a device of this kind is the list of accidents which are directly traceable to the cranking of automobiles by hand. The effect of a "kick-back" cannot be foretold and is often disastrous. Many women are also kept from driving their own machines because they are utterly unable to crank them and cannot in all cases keep a chauffeur.

Agent: "Let me see; you ordered a car from me some time ago, did you not?"

Victim: "Yes! I believe I did. If it is all the same to you I will be willing to change that order to an entreaty."

* * *

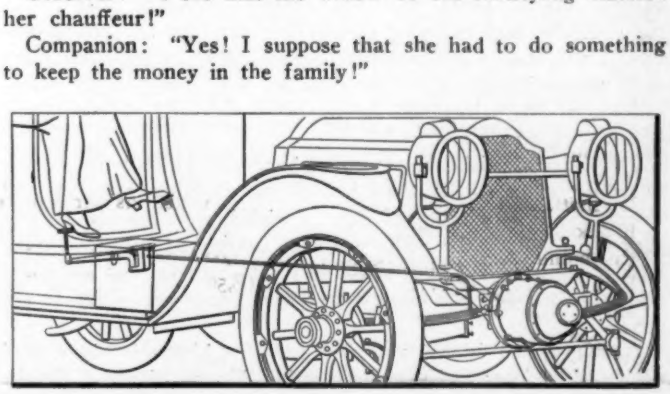
"Your Honor," said the attorney, "I propose to show that this prisoner stole ten inner tubes out of the locker of my client's car."

Judge: "So! How do you propose to make a case out of ten inner tubes?"

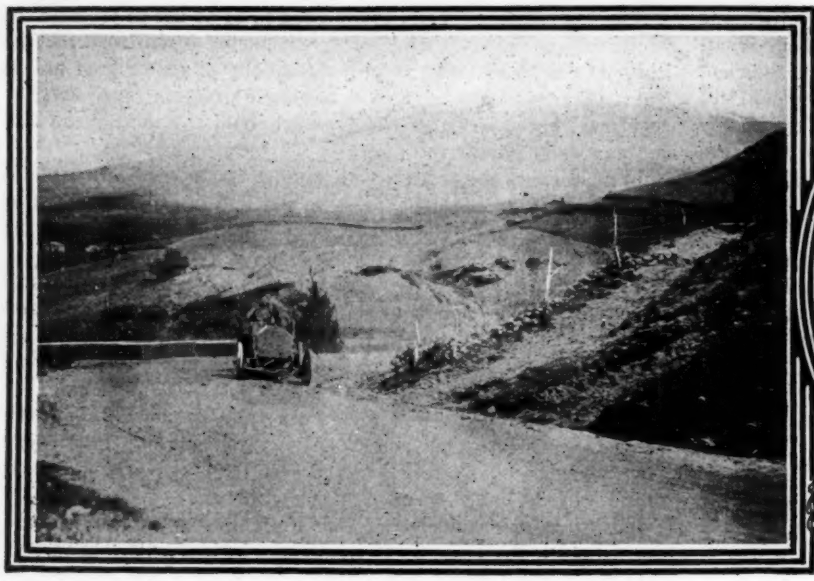
* * *

Observer: "I see that the widow of old Moneybag married her chauffeur!"

Companion: "Yes! I suppose that she had to do something to keep the money in the family!"



Illustrating the installation of the Every-Ready Starter on a town car



A—Hair-pin turns are met at frequent intervals on Sicilian roads B—The author and party after descending into one of the beautiful valleys

Word-Picture of a Sicilian Tour

Describing Some Beauty Spots of the Lovely Island

E. B. Row graphically describes a most enjoyable trip he recently took through the island over which Mount Etna towers in awful grandeur, but which Nature, possibly in recompense for the woes visited upon it in the past, has endowed with a beauty which makes it famous throughout the world.

IN the seventy-odd thousand miles of touring through Europe in an automobile, none of the territory has so appealed to me as the trip just completed around the pretty island of Sicily.

Everywhere there meets the eye a continuous riot of color, with stupendous masses of mountains that overlap each other like the waves of the ocean—mountains everywhere, with lovely valleys in between and no level land, with Etna reaching out into the sky, a dome of dazzling snow towering above all other peaks.

As you skirt the eastern border of the island you run over beautiful roads, narrow but as smooth as the Cornichie on the Riviera. You pass through town after town with towers, castles, bluffs, capes and high-topped headlands with rocky promontories and sweeping curves of shore line, all coming into view like a stately procession. To each curve of the coast there is an answering curve of beauteous sea with hundreds of indentations, needle points and forelands of rich and glowing hues, brown, red, purple and violet.

The cities furnish endless quays bordered with snowy palaces in white stone, sickle-shaped harbors, shelving terraces and exquisite vistas of cape and bay. I wish it were possible to picture the foam of the white sea surf beating against lava cliffs with the deep blue tinting of the hills and ever-varying mountain lines that wander heavenward and then sweep gracefully to the sea.

A gem of an island, and with such a history! Gods and demi-gods, heroes and nymphs, nereids, Moors, Sicilians, Greeks and Romans, invaders from every land, in all ages and since all time, each race leaving the traces of its conquests in stone. In Messina all that was left standing after the earthquake was the cathedral.

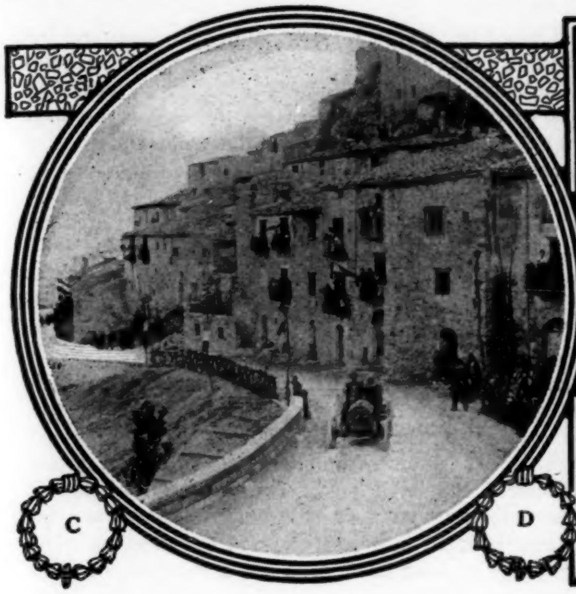
The gods have done much for this city, and as long as mountains and sea, sun and sky hold together, it will always be beautiful. Somehow there is an air of innate loveliness one can recognize in a city, as in a woman. Messina has it, while her shipping lends a tinge of cosmopolitanism.

Leaving Messina on the north, you drive over pretty roads, rounding capes and promontories where the blue sea breaks against low rocks, the waves swarming upwards in sheets of curling foam, which mark the outline of delicate bays. Every yard of the highway is historic ground and the home of classic mythology. Every sandy baylet, river, rocky point and headland has its legend.

For over forty miles we drove our Packard in sight of Etna on the north, a wonderful giant, three miles high, the monarch of volcanic life and action. Forests of cork wood, olive, lemon and orange groves encircle its sides for seventy-five miles like a green belt; above this comes the snow line, a mile in width; around its craters all is dead, with lava boulders and streams of blackness flowing from every side.

Taormina is the picturesque city on this end of the island, a pretty spot lying nearly a thousand feet above the sea. From here you visit Etna, whose white flanks sweep down into fertile valleys, dashed here and there by a blackened lava stream. There castles, towns, convents, churches on every height, groves of fruit and vineyards glowing in pretty colors in the transparent atmosphere, while high above the volcano cuts the sky as sharp as steel and steamy clouds from the craters fill up the picture.

At the foot of Etna lies one of the finest harbors in the world, destroyed by lava with ninety thousand of inhabitants, the old city of Catina. A wall of lava forty feet high fills up the port and runs out to sea beyond the entrance of the harbor. Etna is noted for its wine, and vineyards clothe the hillsides on every hand.



C—The mountain sides form a natural grandstand on race days

D—Interested spectators in the Targa Florio race which is run in Sicily

While in this section no one should fail to visit one of the largest monasteries on the island, where below the church are placed the tombs of the departed. I looked into this burial place where, arrayed in their vestments, all classes of people, dried and set up against the wall or held in niches, or laid to rest in their caskets, are exposed to the view of the visitor. In one velvet-lined trunk was Cardinal Gibonois; next came Count Conrad, son of the philosophic Frederick II; then came Alfonso the Magnificent, King of Naples and Sicily; also many people of Norman line and a royal woman whose name I forget. Here they all rest like passengers in a free berth on a quiet sea. Here are bishops by the score, priests without number, individuals of every station in life sitting or standing for centuries.

The next large city towards the east from Catina is Syracusa, the largest of the Greek ports, and strong in its natural position either by land or sea. From every quarter of the globe enemies came to this city, taking this place as a landmark for invasion.

The Catholic cathedral here is built over the shrine of Minerva, and some of the Grecian columns mark the side of the church. Of the temple of Diana only little of the marble remains to mark the spot of this once beautiful structure.

All the Sicilians in the country places proved friendly and even cordial. They keep many dogs, which they seem to love as much as their babies. We stopped in mountain cities and were well entertained, the food being very good, but the luxuries in sleeping apartments are apparently not understood.

Sicily is Greek, Doric Greek, as seen in every ruin and temple, some structures still perfect, with no stone missing.

The colors of the sea are marvelous. As you follow the shore line you see blue of every tint, azure running into reds and browns, buff, cream and yellow with sheets of foam that look like lace-work on the pretty shores.

Short Stories of Current Interest

Unraveling the Puzzling Situations

As the art progresses certain apparently unanswerable questions recur, but when the irrelevant matter is eliminated it is not so difficult to get at the facts and arrive at a fitting conclusion.

IN the discussion of the lubricating problem as it is being presented in THE AUTOMOBILE from time to time, there is an apparent attempt on the part of those who, for one reason or another, cannot well use a lubricator, to show that this device is not essential to success and that simplicity is duly represented when the lubricator is dispensed with, provided only that some lubricating oil is placed in the gasoline tank where it is supposed to be dissolved, and after it flows out of the gasoline tank through the carbureter into the crankcase of the motor it is supposed to recollect the scattered remnants and to present itself in force at the portals of the bearings, where, after knocking for admission, it is bowed in and permitted to do the lubricating work of which the bearings have enough and to spare. One enthusiast, in decrying the idea that an unbroken film of lubricating oil is desired between the journal and the box, went so far as to build a testing equipment on the electrical principle for the purpose of showing that lubricating oil does not present an unbroken film, for, as he states, since lubricating oil is said to be an insulator, should it form an unbroken film the resistance would be so high that an electric current would fail to pass. We do not know whether or not this test shows that the particular lubricating oil used in the experiment is suitable for lubricating purposes in automobile work, but if it is the test as conducted shows that it was not an insulator. If, on the other hand, the test shows that there was no evidence of an unbroken film, it may be taken for granted that the lubricating oil was not of a suitable quality for this class of work.

LIGHTING dynamos are coming into vogue and present practice is somewhat divided between the types of generators that are provided with an electro-magnetic field and the makes

of machines that are equipped with permanent magnets. Since all of these generators have to deliver a direct current for the purpose of charging a storage battery they must be provided with a commutator, and the first difference that a user of an automobile must appreciate is the fact that the average magneto as it is used in ignition work is not equipped with a commutator, but it has a collector ring instead, and the current delivered therefrom is alternating in its characteristic. Since lighting dynamos as they are used in automobile work cannot deliver current for lighting purposes when the engine is shut down, it is the function of the storage battery to supplant the lighting dynamo during the period of engine inactivity, and it remains for the lighting dynamo to charge the storage battery as well as to furnish current for the lights when the engine is running.

One of the serious problems lies in the lack of ability of the average small generator to deliver current at a low speed, and this, in the face of the fact that automobile engines when operating under average conditions run at a relatively low speed, makes it necessary for the user of the car to watch the relation of the generator to the storage battery and to make sure that the battery is not "starved." Some generators are capable of delivering the full charging current at approximately 1,200 revolutions per minute, but it is unfortunate perhaps that quite a number of them deliver but a feeble current at this speed.

When the lighting equipment is new and the storage battery is in good working order it is more than likely that a poor generator will fail to show its weakness, but as the battery tapers off in capacity, and a condition of persistent sulphation arrives, the generator will fail to supply the need and the state of unbalance existing will become only too apparent to the owner of the car. In the purchase of a lighting equipment it is wise to observe the lowest speed at which the generator will furnish the full charging current for the battery, and it is also desirable to observe whether or not there is undue sparking at the brush tips as they contact with the commutator, this being evidence of overwork or a bad state of design of the generator. The practice of looking at the lights to see how bright they are and of judging of the capability of the lighting equipment based upon the illuminating properties of the lamps is bound to lead to a few heartaches on the part of those who are so readily convinced.

WHEN the engineering department of an automobile manufacturing company spends days and nights for months and months in search of the means for silence of the product it is spending money which the purchasers of cars will have to furnish, and it is worth while doing so if the object sought after is gained. But when the automobiles are finished and they are placed before the discriminating eyes of the purchasers it will be too bad if the side-doors of the body are so loosely hung that they will continuously rattle, and it will be a great shame if the mudguards are fastened to the irons by means of flimsy stove bolts. The methods in vogue in many plants are such that the engineers who go in quest of silence have little or nothing to do with the body work, and this plan in the face of a certain type of conceit that finds lodgment in the being of the bodybuilder makes it easy to see how more than 50 per cent. of all the noise can readily come from the part of the equipment that the engineer has nothing to do with. Fortunately, noise is a condition that the average purchaser can testify to if it exists in a given make of car, and if the builders of automobiles continue to tell purchasers how silently their products perform they may expect that the time will come when these purchasers will take their word for it and govern themselves accordingly. Fortunately, too, it will be quite an easy matter to hang doors in bodies so that they will not rattle, and as for encouraging the makers of stove bolts life is too short.

HABIT gets in the way of every reform that is undertaken, and the man who has acquired all of the refinements of a first-class habit is willing to swear that it is founded upon a true principle and has right as its mainstay. In the meantime the habit of putting a battery box on the runningboard of an automobile, like the habit of placing the tires in a sling so located as to prevent the driver from getting into the car, is like the habit of placing the headlights on brackets at the front ends of the side bars so exposed that they have to do a double duty, but they serve but poorly as bumpers when the occasion requires. When automobiles were first made the designers thereof were actuated by a certain enthusiasm and they promised so much for their wares that it never occurred to any user that he would have to equip himself with tools for the purpose of making roadside repairs, hence no provision was made in the original designs for the storage of tools.

In the same way not a few tiremakers thought that their "pneumatics" would last for a long time, and the idea of taking along a spare tire was an after-thought dictated by experience on the part of users of automobiles. In the meantime, purchasers acquired the habit of buying cars as they looked standing upon the salesroom floor before the tool box and the spare tires were mounted into position, and the pleasing effect produced really had nothing to do with the appearance of these cars after they were loaded down with junk before they were put into service.

The builders of bodies are beginning to realize the necessity of making provision for the storage of tires in a covered position, and the thought is coming to the front that there should be a compartment for tools. Moreover, there is a splendid opportunity for some bright mind to think out a form of tool compartment that will have a place for everything necessary, and that will keep it in its place without rattling. In the placing of lamps the newer form of flush (electric) lamp is being commented upon favorably, and it is now believed that bodies can be so made that there will be room for everything essential to the success of a tour without detracting from the comfort of the owner of the car and the guests whom he might be pleased to take along.

May Happen to Anyone

There are times on a tour of any length when a cool head and a knowledge of what to do under the circumstances are of invaluable assistance to the driver, be he professional or amateur. A hint which is the proof of experience may be of use.

AN affair of frequent occurrence in general driving is the ascent and descent of steep and slippery hills. Obviously, in descending, the brakes must be used in order to keep the car under control, but the autoist often finds that their application causes the rear of the car to swing around, particularly if one hub-brake has a better grip than the other. With smooth tires, that is, tires without studded treads or unequipped with chains, the situation is hazardous despite anything the autoist may do, but in all cases such hills should be approached at a walking pace and the car prevented from increasing its speed by judicious use of the brakes the whole way down. Equally awkward is the ascent of a hill thickly coated with mud. In such case, once the wheels commence slipping the car may tend to spin in a circle and to slip backwards while so doing to the bottom of the hill. If the hill is extraordinarily steep and greasy, several circles may be described if the car is small or has excessive clearance, and the autoist will not have the slightest control over the car during the evolutions. In climbing ordinary hills that are greasy, a moderate speed should be maintained from bottom to top, avoiding any sudden acceleration of the road wheels, and momentarily easing off the drive to enable them to regain their hold at the first signs of excessive spinning. The ability to drive at a constant speed is invaluable to the autoist in cases like this. Where ascents or descents are hazardous, rope wound around the tire and felloe is often an invaluable aid.

When Judgment Whispers Don't

A Series of Abbreviated Injunctions

It is suggested that common sense and uncommon dollars are congenial to each other, and through force of habit occupy well-cushioned seats in the same chariot.

DON'T look for a rich farmer on a bad road.

DON'T look for a bad road in front of a rich man's residence.

DON'T object to the improvement of roads just because you are not the possessor of an automobile.

DON'T forget that your income may be traced to automobile activity.

DON'T sit in the Senate if you are so stupid that you bark at the automobile fraternity.

DON'T undertake the futile task of proving that you are an intellectual if you legislate against the third industry in the world.

DON'T fail to resign your position in the Legislature if you examine yourself on a dark night and find that you are an incompetent.

DON'T delay action just because you fail to see the point—the public will understand it if you don't

DON'T advocate that the residents of the penitentiary make clothes for you to wear—they can be placed to better advantage fixing the State roads.

DON'T permit States' prisoners to compete with honest workmen in the industries—road-building is a much more healthy occupation for prisoners.

DON'T fail to request your representative in the Legislature to make some provision for the maintenance of roads.

DON'T overlook the fact that road-building represents a waste of money if no provision is made for the maintenance problem that follows.

DON'T eschew political activity on the ground that you are too immaculate to rub elbows with the type of politician who would rather see you vote from a cemetery than elsewhere.

DON'T let political grafters run your business for you—do you think so much of them that you would place them in your own office?

DON'T fail to appreciate the fact that every politician is working for you whether you like it or not.

DON'T forget that some politicians give two licks for themselves for every lick they give for you.

DON'T take your automobile over a bad stretch of road without making a complaint in writing to the president of your club.

DON'T belong to a club without advocating that its members go in for good roads.

DON'T try to usurp the functions of the officials of the club to which you owe your allegiance.

DON'T forget to nudge the officials of your club if they go to sleep.

DON'T fail to appreciate the difference between co-operation and the action of a disorderly minority.

DON'T be discouraged if you fail to get action the first time you bring an important matter to the attention of the club officials.

DON'T act with impatience in the face of an important emergency—success follows in the wake of calm and deliberate presentations of good arguments.

DON'T try to have your own way unless you can at least prove to yourself that it is a good way.

DON'T expect others to approve of your way if you cannot approve of it on your own account.

DON'T run around in an automobile without knowing anything about speed laws.

DON'T forget that law is supposed to be based upon common sense as well as upon precedent.

DON'T fail to display a fair measure of common sense if you are short of legal lore.

DON'T try to become a curb-stone lawyer if a policeman makes a few pointed inquiries about the speed at which you were driving your car.

DON'T try to convince a policeman that you were going backwards if your car was picking up the road in the opposite direction.

DON'T object to reasonable police regulations, even if they do differ from each other in the towns that you pass through in a day.

DON'T forget that the citizens of each township have the happy faculty of understanding their own local situation in a manner satisfactory to them.

DON'T forget the old adage "When in Rome do as the Romans do."

DON'T toil with ignorance—learn something about the mechanisms in your automobile.

DON'T act like a star of the first magnitude when you meet a farmer on the roadway—he may have a little star factory of his own.

DON'T mistake egotism for power; the egotist stands in front of a mirror; the man of power has a strong stride, but he never gets out of breath.

DON'T fear your self-appointed enemies; they are more scared of you than you can be of them.

DON'T be eddied out of the main current—your franchise is good; use it.

Vanadium in Steel

Describing the process to be followed in testing a sample of steel in order to ascertain if vanadium is present therein, and in what quantity. By this test it is said to be quite possible to detect as small a vanadium content as 0.01 per cent.

A RAPID chemical method for ascertaining the presence of vanadium in steel is based on the fact that a brownish-red coloration is displayed when vanadium salts are acted upon by peroxide of hydrogen. The method of making the test is as follows: Dissolve 0.25 gram of the steel to be examined in 4 cubic centimeters of nitric acid of density 1.20; heat; add about 0.3 gram of persulphate of ammonia. There follows a discharge of gas. Heating is continued until this discharge ceases. Then the solution is cooled. There is added 3 to 4 cubic centimeters of phosphoric acid of density 1.30. The yellow coloration due to the iron ceases and the liquid remains only faintly rose colored. Shake. By means of a pipette 3 to 4 cubic centimeters of peroxide is poured into the test tube slowly so only thin films of the two liquids are mixed at the point of contact. In the zone of contact there is now formed, if vanadium is present, a brownish-red ring. As little as 0.01 per cent. of vanadium can be detected by this method. By comparison with samples of steel whose vanadium content is known, and which are treated in the same manner, the vanadium content can be approximated.

Facilities for the Hardening Room

Quenching Baths and Their Accessories

E. F. Lake discusses quenching baths for the hardening of steel and makes comparisons for the benefit of the man who must obtain results, giving quenching temperatures and simple rules for the governing of the process, illustrating the points that are uppermost in the story.

A GREAT deal of attention should be paid to the baths in which to quench steels when hardening. This is of as much importance as the degrees of temperature to which steel is raised or the constitutional changes that take place. The rate of cooling is not instantaneous and consequently is not swift enough to secure perfection. Thus the intermolecular transformation will be more or less incomplete, according to the rate of cooling; the better the bath the better the results that are obtained.

Many different materials are used for quenching baths, and the more common are enumerated below according to their intensity on 0.85 per cent. carbon steel: Mercury; water with sulphuric acid added; nitrate of potassium; sal ammoniac; common salt; carbonate of lime; carbonate of magnesia; pure water; water containing soap, sugar, dextrine, or alcohol; sweet milk; various oils; beef suet; tallow and wax.

As the conductivity and viscosity of these baths varies greatly with their temperature they do not act under all conditions with the same relative intensity. The curves of intensity are therefore very irregular and cross each other frequently. With the exception of the oils and some of the greases the quenching effect increases as the temperature of the bath lowers. Water at 60 degrees will make steel harder than water at 160 degrees. Sperm and linseed oils, however, at all temperatures between 32 and 250 degrees F. act about the same as distilled water at 160 degrees F.

The influence of the bath depends upon its nature, its temperature and its volume, or, in other words, on its specific heat, conductivity, volatility and viscosity.

The specific heat of the bath is an important factor, and yet but little attention is paid thereto. The more rapidly we cool a high carbon steel from 1650 to 200 degrees F. the more effective will be the hardening process, these being the temperatures at which the transformation corresponding to the hardening process begins and ends.

When a bath is constantly used the first piece quenched will be harder than the tenth or twentieth, owing to the rise in temperature of the bath. As soon as the heated metal is plunged into the bath the liquid begins to heat. The number of calories necessary to raise the liquid's temperature a certain number of degrees will be the greater the higher its specific heat. A bath is the more active in proportion as its specific heat becomes higher. The less rapidly the equilibrium is established between the hardening bath and the metal quenched in it the more active will be the bath.

Mercury has a much lower specific heat than water, and quenched steels are cooled nearly three times as rapidly in water as they are in mercury. The hardening effect is therefore much lower than that of water, but surface cracks and fissures are not nearly as liable to occur.

As steel is plunged into a liquid that volatilizes easily at the high hardening temperature a space is formed around the metal that is filled with vapor, and this retards the further cooling action of the liquid. To overcome this it is necessary to either keep the piece moving around in the water or keep the bath in motion so that these vapors will be thrown off and fresh liquid be continually brought into contact with the metal. This continual motion effects the exchange of heat between the piece being hardened and the bath, and the greater the conductivity of the bath the more quickly the metal cools. The viscosity of the bath has an influence on the phenomenon of convection, which is the principal means of the exchange of heat; the higher the viscosity the less its hardening effect.

The mass of the bath can be made large, so that no great rise in temperature occurs when continually cooling steel pieces. If the rise in temperature of the bath can be properly regulated it can be made small and this rise in temperature be made useful when hardening parts that should remain fairly soft. It would thus save the time used in reheating and tempering the piece later and largely overcome the liability of its cracking or checking when quenched.

Another way of arriving at the same results would be to use a double quenching bath. In this process lead or salt is often used and maintained at a certain temperature. The piece is quenched in these until it reaches their temperature and is then removed and quenched in a cold bath or cooled in the air.

The baths which give the best results are those in which the temperature is always kept even. If considerable time elapses

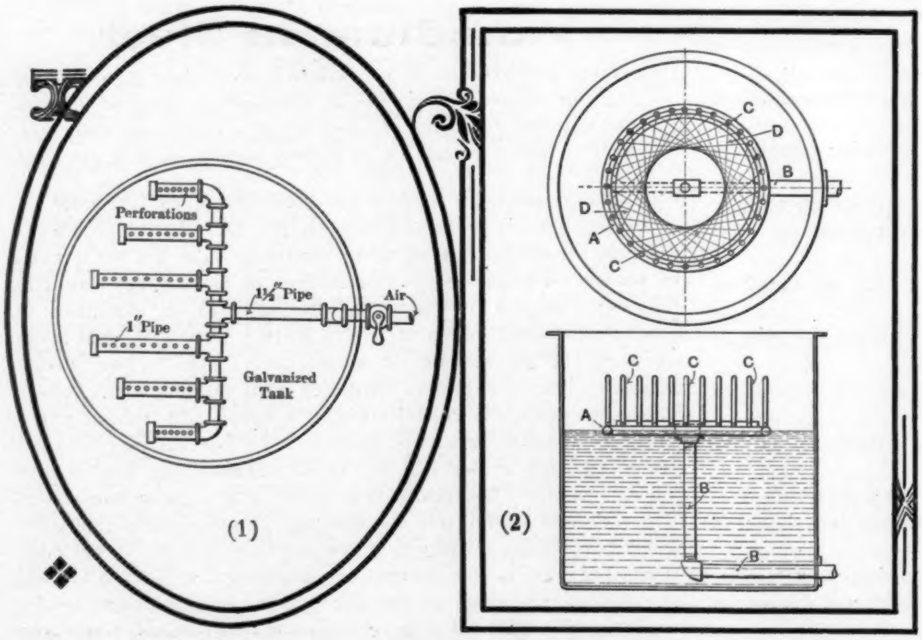


Fig. 1—Showing the method of piping in the bottom of a quenching tank for the distribution of the air that is proposed for the agitation of the bath
Fig. 2—A spraying type of quenching bath for use in the hardening of steel

between the quenching of different pieces the bath will retain an atmospheric temperature from its own natural radiation. When a continuous quenching of pieces is necessary some mechanical means must be provided. The bath must either be very large, so it will keep cool from natural radiation, or the liquid must be kept flowing in and out of a small bath to keep it cool. Better results can be obtained from the small bath cooled by mechanical means, as its temperature can more easily be regulated and kept constant.

One method that gives good results on certain kinds of work is the spray that is thrown from a circular gas pipe with perforated upright pieces, as shown in Fig. 2. In this A is a circular gas pipe into which are screwed perforated upright pipes CC and intake pipe B. Water coming through perforated pipes CC forms a spray on lines DD.

Another method is to place pipes in the bottom of the bath, as shown in Fig. 1. The liquid is pumped through these and allowed to overflow at the top.

Another method is to surround the tank with a perforated sheet and pump the liquid through these perforations. Some baths of this nature have been fitted up with a conveyor that carries the pieces through the bath and drops them into receptacles placed at the other end.

The Search for Silence

With the disappearance of noise from the motor, those other members of the chassis whose noisy performance was formerly drowned in the motor's din, have become prominent disturbers of the motorist's equanimity, which presages, among other possibilities, the more general adoption of the worm drive and a substitute for the live rear axle with its loose joints.

NOISE as it is being taken out of the motor uncovers the noise that has always resided in the chassis, and the coming of the silent types of motors has brought designing engineers to a realization of the fact that what they call silent performance in the chassis amounted to a positive din. In the meantime, purchasers of automobiles have been preached to about silent performance until some of them have been persuaded to believe that their noisy machines were silent and that noiselessness is the first requisite in the operation of an automobile. Under the acute conditions of to-day it costs more money to get noise out of an automobile than it does to build the car. Where this search for silence will end it is difficult to say, but the fact remains that quite a number of automobiles are unduly noisy because of the use of stove bolts in the holding of the mudguards and in the employment of other flimsy pretexts that have no fitting place in the makeup of an automobile. In the meantime, it is pointed out that some of the most approved practices of the present day are at variance with the necessities from the silence point of view, as, for illustration, a full-floating live rear axle has a number of loose joints in its makeup, nor would it be a full-floating live rear axle were these loose joints done away with. How to drive through a dog and maintain a condition of silence is one of the problems that engineers have to cope with, and if the search for silence continues, becoming more acute than it is today, the live rear axle and the dog drive will certainly have to make way for the type of fits that do not depend upon lost motion. The best argument in favor of the worm drive is that of silence, and the probabilities are that the search for noiseless performance will bring the worm drive into general use to the entire elimination of the bevel drive. It is not claimed that the efficiency of a well-made worm drive is quite up to 95 per cent., and few indeed are the engineers who will make so brave as to claim that a bevel drive has an efficiency of more than 95 per cent. It was not so long ago when one automobile-building concern claimed that in the search for silent performance it had to discard 55 per cent. of all the bevel gears that were turned out in its plant, and the wildest flight of the imagination is insufficient to make one believe that any such poor luck would attend the building of worm drives.

Labor-Saving Device in the Testing Shop

In days of large production such as the present every conceivable means is devised in the shops to save the men unnecessary labor. It was no common occurrence a few years ago to see motors being carried by two or three men from one part of the shop to the other, but such laborious methods no longer exist. Either a traveling crane is used or the motor is placed on a truck which runs on rails, and by the aid of turntables it can be transferred from one shop to the other. That is all very simple and the next operation after the fitting cannot be regarded as hard work. This consists of "running the motor in" by means of a belt, using the flywheel as a pulley off another pulley of suitable dimensions attached to the ordinary shafting. This operation may last for several hours, according to the motor; but when it arrives in the running shed and is run under its own power for several hours and the different parts adjusted, the tester is usually given the task of starting the motor in the usual manner, *i. e.*, with a starting crank. To do this once or twice is no hardship, but when he has six to one dozen motors to test and they have to be stopped, say, every half-hour or oftener, the amount of manual labor that the tester has to perform is infinitely greater than the testing operations themselves. Besides, he soon becomes tired, and a tired man cannot be expected to furnish the same good work as a man who is fresh. In order to overcome this a means was devised in the Everitt plant in Detroit, whereby all manual labor in starting was done away with. With an electric motor on wheels, as shown in the illustration and a pulley attached to the main shaft, a belt can be slipped over the flywheel of the motor to be started. The electric motor is then started, the current being furnished from main leads and a length of flexible cable can be fitted into one of the several plugs in the wall. The tester then gently pushes the truck forward along the rails and as the tension of the belt increases the motor is started. It is an easy matter to throw the belt off the flywheel. The illustration shows only three motors, but in reality there is often room for twenty at a time along the line.

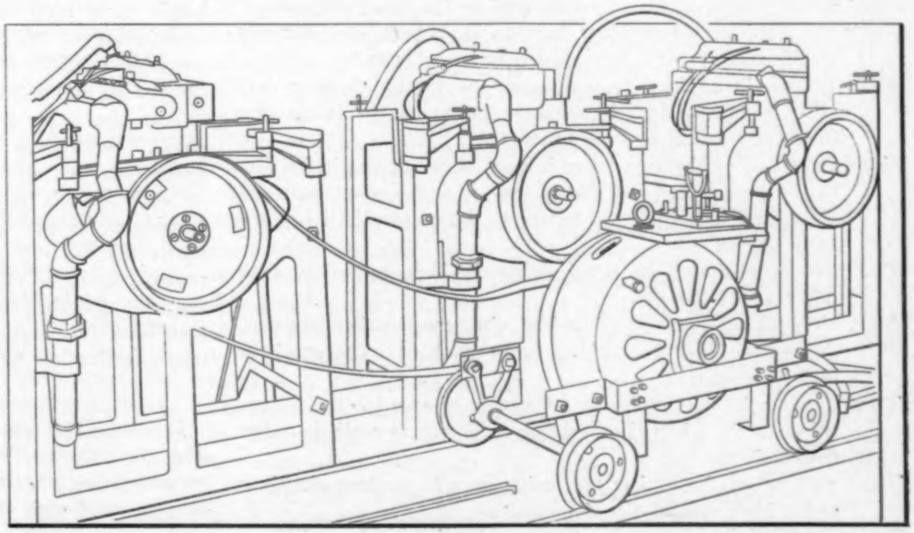


Fig. 1—Method of starting motors in the Everitt testing shop by means of an electric motor and a belt

It Stands to Reason—

(When Common Sense Sits Alongside of the Driver)

THAT tires are made of that strange substance called rubber in combination with a frail fabric called "cotton" no matter how carefully they are made, and long life is only to be experienced if the automobile is driven at a slow rate of speed when the roads are bad.

THAT long life of the tires will not fall to the happy lot of the automobilist if high speed is indulged in when the mercury in the thermometer soars to high levels.

THAT over-inflation is too much feared by the average owner of an automobile, and it is scarcely to be supposed that a puny tire pump will be guilty of any such crime in any event.

THAT under-inflation is the common disorder that besets tires at every hand.

THAT a tire-gauge is the only sure tell-tale available to the man who desires to operate his tires at a predetermined pressure.

THAT even a tire gauge accompanied by a poor pump in the hands of a lazy chauffeur will fall short of its intended purpose.

THAT the lazy man may not be a chauffeur after all.

THAT any amount of pressure will be of small avail if the tires are too small for the work that is assigned to them to do.

THAT the purchaser of an automobile should decline to take a demonstration from the maker if over-sized tires are used on the demonstrating car, provided they are not used on the car that the purchaser is to get.

THAT tires indicate their lack of proper size if they cannot be inflated to roundness under the load that they have to operate with.

THAT tires will creep in the rims if they are not properly fastened and no end of trouble will result.

THAT a tire lubricant, such as talcum, should be used between the tube and the case to prevent chafing of the walls of the tube.

THAT tires will be eaten up by mildew if the rubber coat is punctured and water is permitted to get at the cotton of the fabric.

THAT rubber is used as a seal to prevent mildew from getting at the cotton of the fabric as well as for other purposes.

THAT the average automobilist fails to appreciate the enormity of the appetite of a few million mildew "bugs."

THAT rubber, in addition to sealing up the fabric, shows a certain strength besides binding the layers of the fabric into intimate relation to each other.

THAT the tread of the tire, since it must serve as the buffer between the roadbed and the carcass, is made of a toughened compound that will only adhere to the carcass if it is carefully put on.

THAT the carcass and the tread should be kept welded to each other all of the time.

THAT tires will give out more rapidly when the weather is warm, due to the fact that rubber loses much of its strength at high temperatures.

THAT driving the automobile at a low rate of speed is the proper thing to do when the weather is warm as well as when the roads are bad.

THAT putting on the brakes too suddenly will produce skidding and a high rate of tire depreciation.

THAT good driving cannot be measured by the number of times the brakes are suddenly applied.

THAT going around a corner on two wheels may be picturesque, but the tire bill resulting can scarcely be viewed with equanimity.

THAT an automobile will make the greatest possible distance in a given time if it is driven at a uniform rate of speed.

THAT storing an automobile in a garage where the floor is coated with grease adds to the cost of storage to the extent of at least four tire cases per month.

THAT standing an automobile out in the glare of a summer's sun is the best way to help the tire maker broach a watermelon.

THAT high-speed work when the road is wet and jagged rocks abound is another way to keep the tire maker out of the poorhouse.

THAT the tire maker is already too busy, and it is unnecessary to burden him with the making of extra tires for no better purpose than to furnish replacements to the type of man who would not know common sense if he saw it coming down the road.

Long-Distance Touring in Australia

Recounting the difficulties experienced by a party of automobile tourists in Australia, where it is sometimes necessary to keep a sharp lookout to avoid missing the road. Sandy wastes abound in some sections, and if the travelers lose their way, it means a long delay, and possibly worse.

THE ride just concluded by a party of prominent Australian automobilists from Adelaide to Sydney was full of interest. They passed over many pleasant stretches of Nature's highways, many of them unimproved. One of the interesting runs covered 92 miles, between Kinkston and Meningie, which occupied a day. But at all times one needs to look well ahead, for to lose the road means a series of difficulties and maybe mishaps. Take, for example, the Coorong, a cheerless waste, where mighty sand drifts choke the roadway. Some of these drifts rise to a height of 87 feet, while heaps of from 7 to 10 feet high are common barriers. When practically lost amid these sand drifts, the automobilist finds it very difficult to make a long detour. He is obliged to watch for the proper divergence by means of which he can shoot his motor car through into the region of roads again. Sometimes it happens that the automobilist misses the longed-for deviation path, owing to scant evidence of travel. At such periods he brings his car to a standstill, hard against a forbidding ridge of sand. The result is that when the wind blows the automobilist "grits his teeth" in good earnest. Recently a party of motorists lost their way while casting about in the sand and they had quite given over to despair when a horseman hove into sight who piloted the car along a crooked route, thus enabling the party to reach Miningie as the night closed in.

LONDON, ONTARIO, has adopted the motor car method of sprinkling the streets. The City Fathers have put two automobile sprinklers into commission, thereby saving $14,000 annually, as compared with the horse-drawn watering cart service. It is proposed to install two more of these sprinklers, doing away with horse-drawn vehicles for this work altogether.

How to Improve Harsh Suspensions

Hints on How to Secure an Easy-Riding Car

The question of the suspension of cars is dealt with in a recent issue of "La Vie Automobile," by André Guetet. The action of the springs is considered in some detail, and the necessity of paying attention to the centering of the superimposed masses is also explained.

IS it possible to ascertain if a car is well suspended by a simple inspection of the springs? This is a question that drivers often ask themselves. First of all, what is a well-suspended car?—a question that is much more difficult to answer than would be imagined. One often feels, in comparing the riding qualities of one car with those of another, the difference in the comfort; but there lies a set of variable quantities even in the same car, according to the road surface, the weight carried, the state of lubrication of the springs and also the question of shock absorbers, and so on.

Quite independent of the want of comfort of a badly suspended car, it is safe to say that it is far from economical. From two points of view such a car is a burden. First, on account of the continual bumping of the driving wheels on the ground and the harsh recoil on the road surface, each blow thus struck forms as it were a rasp of great power that causes the tire to part company with the precious rubber casing. This inconvenience is particularly noticeable on certain shaft-driven cars. Secondly, one thing must be borne in mind, viz.: every shock and every resulting vibration takes away power from the motor, which will entail an increased and unnecessary consumption of gasoline. It has been noticed in some cars, to which shock absorbers of good construction properly regulated have been added, that by simply removing one leaf of the spring an increase in fuel consumption has resulted, even as much as 1/3 to 1-2 of a gallon in 100 miles, according to the power of the motor, and without touching the carbureter regulation at all.

The question of good suspension is a vital one in the conservation of a car. The shocks and vibrations quickly cause the homogeneity of the different points that are attached to one another to become broken. There is not a car made in which there is not some vibration, and this must be eliminated as far as possible. Besides, it is a well-known principle in mechanics that a noisy machine cannot be economical. It remains, therefore, to consider the different methods that can be used in order to better the suspension of a given car.

At the outset there is a question of the why and the wherefore. Why is it that manufacturers do not make all cars with soft springs? There are two reasons for this—one being that they cannot know beforehand if the car is to be fitted with a light touring body or a limousine, and they choose, and rightly so, a happy medium by fitting semi-soft springs. In most cases when a chassis is tried out on the road on what is called the road test it is fitted with two spider seats and a box which should be fitted with weights, but these are seldom used on account of the tiresome operation entailed in the lifting. It is evident, therefore, that the chassis is tested for mechanical efficiency only, the question of suspension not being considered in the trial. The second reason is that constructors, relying on the excellence of certain shock absorbers which are to be found on the market, and which can be regulated according to the weight of the car, leave this regulation of the springs to their clients. It may be noted that several manufacturers of high-grade cars deliver their chassis already fitted with shock absorbers, and it only remains to adjust them. This is, perhaps, one of the happiest solutions of the suspension problem.

How can one find out *a priori* whether a suspension is soft or hard? It has been shown that the springs should be—

1, sufficiently flexible to absorb the shocks due to the inequalities of the road;

2, sufficiently resisting and elastic so as not to take permanent deformations under a heavy weight or from a very violent shock.

What is known as the flexibility of the spring is the quotient of the flexure divided by the weight of charge, and it is calculated in millimeters per hundred kilograms. There is another point to be considered, and that is that in cases of great oscillation the chassis shall not touch the axle.

The flexibility of a spring depends upon its dimensions; it is advantageous to use springs sufficiently long to withstand the large amount of deformation and sufficiently broad to give the car a trim so that it will withstand the transverse strains. In order to take care of this latter it is necessary to always place the rear springs, which carry the most weight, outside of the chassis frame and as far apart from one another as possible. The front springs, which only have to support the weight of the motor and to resist the oblique strains when the wheels strike obstacles, are always under the chassis, which allows of a larger lock for the steering wheels. The length of the spring ranges between 800 and 1400 millimeters (31 1-2 and 55 1-8 inches), measured between the axes of the spring bolts, and the thickness varies from 4 to 12 millimeters (.1517 to .4724 inches). As a general rule the longer the springs are and the wider and thicker the more flexible they will be. This is only relative to the different leaves that form the whole spring.

The entire spring has to resist flexure and torsion, and it is impossible to construct the spring of a single leaf for the double reason that the more leaves there are in the spring's construction the more flexible it becomes; and on the other hand it is more costly. The springs are generally of decreasing length, starting with the master leaf, which is directly connected to the chassis by means of shackles or scroll irons, as shown in Fig. 1. The leaves are held together by a center bolt attached to the perch of the axle by means of clips with a block interposed. As at flexure moments the give of each of the elementary springs is diminished (certain springs are quite flat when not acted upon and work in counter), it follows that the extremities of each of the leaves are displaced and each slides on the one next to it. They are guided in this relative movement by detention pins for the master leaf and by projections in the notches of the other leaves. One thing, therefore, stands out quite clear—the relative movement of the leaves must be facilitated by lubrication. It is most important that this point should receive the amount of attention it requires. Vaseline should be used and spread on the leaves with a piece of cloth while the spring is disassembled. The chassis can be lifted with a jack if it is not found convenient to take the springs apart; this has the effect of causing the leaves to gape in the manner shown in Fig. 2, and with a long-spout can oil may be introduced between the leaves; but the oil should be fairly thick. It has been suggested that springs should be protected from the dust, mud and especially the water used when washing the car, by means of pliable leather covers or some other waterproof material. It would be possible by that means to always maintain the suspension in the same condition and as supple as originally. On quite a number of cars one can see small rusty blotches, which show that the springs are never lubricated.

One means of keeping the leaves in perfect condition consists of introducing between each leaf a very thin layer of special bronze; by that means an automatic lubrication is obtained which is excellent from the point of view of suppleness.

The different leaves have radii of curvature which cross from the smallest to the master leaf; that is to say, the short leaves are more circular than the larger ones, so that the contact between the different components shall be equal over their entire length. Under these conditions it is easy to see that the friction existing between the leaves is opposed to the brutal expansion of the spring and the dual purpose is served as follows: The lubrication of the leaves renders their sliding movement easy under the compression, which permits the spring to absorb as completely as possible the sudden force of the shock during the expansion; the movement is, besides, lessened, which absorbs in a certain degree the oscillations.

The period of oscillation of a spring is quite appreciable; this period may be equal to the frequency with which the shocks are received, or it may be a multiple. In this latter case the amplitude of oscillation may grow indefinitely and cause the breakage of the spring. This may happen on very stony roads, and the only thing to do under such circumstances is to slow down.

Springs may be classified into several categories, as shown in Fig. 3:

1. Half elliptic, that can carry a shackle at either of the two extremities or at both; very much used.

2. Elliptic, consisting of top, half elliptic; bottom, half elliptic, united at both extremities by bolts; not used in present-day construction.

3. Three-quarter scroll elliptic, consisting of upper, quarter scroll; bottom, half elliptic. They are hinge springs when the top half is as shown in A-3 in Fig. 3 and shackle springs when it is curved and attached from underneath to the lower spring, as shown in B-3, Fig. 3. The first type is found fairly often, and the second is found frequently on good cars.

4. C springs, sometimes found on cars de luxe, are very curved —a construction that costs money without adding much to the suppleness.

5. The half springs that are found on some of the cheaper grades of cars have the inconvenience of imposing a large amount of work on the chassis supports.

These considerations, together with the length of the leaves, their number and the width and thickness thereof, permit one to obtain an idea of the suspension of a car for a predetermined weight.

It is a wise plan to mount the axes of the spring shackles with a cardan to prevent the torsion effect being transmitted to the spring. This is found in but one make of car, as far as it has been possible to discover, and that is the Daimler. There are a number of cars of modern manufacture that are not fitted with greasers on the spring bolts with the ordinary type of shackle; these rust up and bind, making a horrible noise and wearing out very quickly and occasioning sometimes a sudden rupture. This is one point of the suspension that should receive attention, and

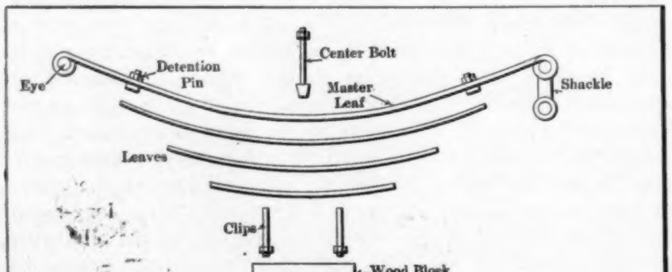


Fig. 1—Different component parts of a semi-elliptic spring and the method of attachment

in purchasing a modern car one should insist on such grease cups being fitted to the shackle bolts as well as the front spring bolt.

The suspension can be improved considerably by using the properties that reside in spiral springs, as these have a period of vibration much shorter than springs of the leaf type. The amount of tension of the spring can be adjusted when it is attached to the shackles in such a manner that it dampens very quickly the vibrations of the suspension. As a whole the good suspension of a car is realized by the use of long and broad springs, with a small amount of flexure and made of good steel, with a preference for that with a percentage of silicon or tungsten. The softest suspension will be found in cars with three-quarter elliptic springs in front (very seldom used) or half elliptic springs; and for the rear using a three-spring suspension known as three-point suspension or by half scroll elliptic springs.

Under normal running conditions the small vibrations that are not greater than 20 millimeters are absorbed by the tires, but for

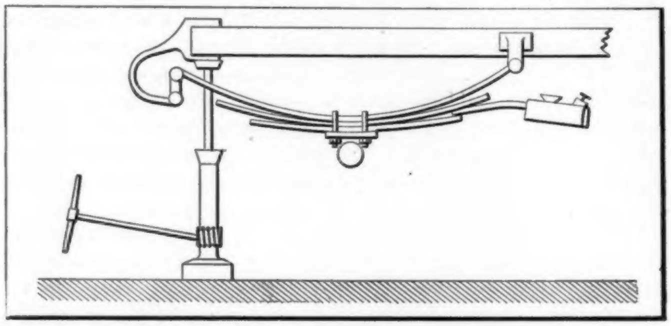


Fig. 2—Method of lifting the chassis by means of a jack so that the leaves will separate and allow oil to be inserted

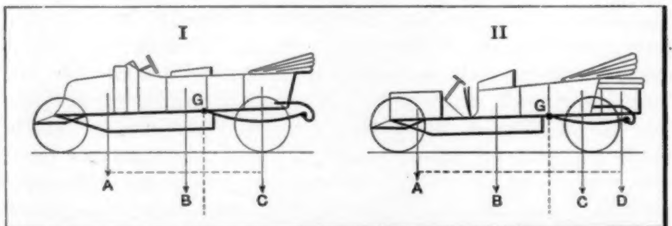


Fig. 4—Showing the difference between the centration of the masses on two different types of cars. It will be noticed that the masses A and D in II are far away from the general center of gravity G in comparison to car I

larger vibrations the spring deflects and by reaction the chassis is forced upwards. In consequence of the inertia of the total mass in movement the bending of the spring becomes greater than it would otherwise be in a state of equilibrium, the recoil and the series of oscillations being the cause of all the discomfort in the car. These oscillations are more dangerous than would be imagined, causing as they do a lifting of the driving wheels and consequently a diminution of adherence; the wheels slide and when contacting with the road surface the tires are subjected to a rasping action each time, causing rapid wear.

In shaft-driven cars the non-suspended mass comprised of the differential and casing together with the wheels and brake drums is very important because the weight may be as high as 180 kilogrammes (about 400 pounds), but in the case of chain-driven cars this weight is not more than from 120 to 150 kilogrammes (264 to 330 pounds). Here is one cause of the wear of tires on shaft-driven cars in excess of chain-driven cars, independent of the road-holding properties, which may be bad, according to the suspension. This may be improved by using springs that have been carefully studied and fitted with shock absorbers properly adjusted. Further, the shaft-drive is drawing recruits every year more and more owing to the silence, its more mechanical aspect, its cleanliness and efficiency.

The duty of shock absorbers (Fig. 5) is, by means of additional friction, to exterminate the oscillations of the springs that

have taken effect under the conditions above stated. These can be classified into four heads, as follows:

1. Friction of two surfaces one against the other.
2. Breaking effect on a liquid under pressure passing through a small orifice.
3. Superposition of the oscillations to be absorbed by those which are much shorter in an antagonistic spring.
4. Air compressed in a cylinder.

There is one point in the suspension of cars that is of especial interest, and that is the centralization of the masses of the car. This question is often ignored by drivers, whereas it should have a great deal of interest for them. It is a well-known fact that a high vehicle, such as a limousine or any covered car, has a tendency to slip in going around corners because the center of gravity is higher than in an open body, which is much lower. But the influence of the distribution of the super weight on the car is also important. One often hears among drivers conversations in which it is stated that such and such a car has a greater tendency to skid on corners than another *because there is too much weight on the back axle.* This is an incorrect method of explaining matters. This inconvenience does not come so much from the amount of weight of charge on the axle but rather from the great amount of distance that is present between the charge and the center of gravity. In order to reduce as much as possible this bad effect on the suspension it is necessary that all the important weight of the car should be as near as possible to the center of gravity of the general system (Fig. 4); in other words, it is necessary that the radius of gyration of each of the important masses should be as small as possible. Under these conditions the inertia effects on these same bodies will be much less on the holding properties of the car on the road surface, as their lever arms will be very small. Under the ordinary running conditions they can be in a vertical longitudinal plane, which is the *galop* movement, alternately tending to surcharge one axle and alleviate the other, and it is dangerous for the tires and upsets the riding comfort of the car. In a vertical plane perpendicular to the axis of the car the rolling movement is less dangerous while driving in a straight line than when rounding corners. Finally in a horizontal plane there is a side rolling which is liable to cause a skid.

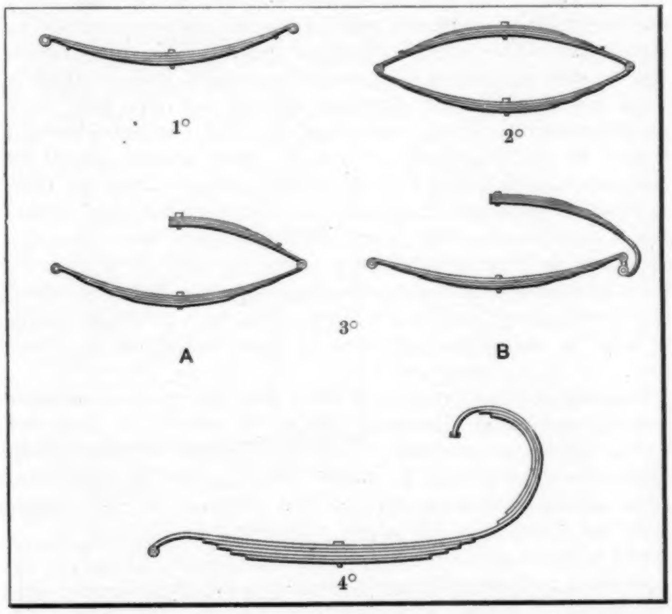


Fig. 3—Different types of springs used in automobile construction

It is possible to see from this short outline how the centration of the masses of a car has an effect on its holding properties on the road and also on the suspension.

The two following rules may be laid down: 1. The general center of gravity of the car should not be too high and about two-thirds of the distance between the axles taken from the front (three-quarters at the outside). 2. It is necessary that the center of gravity of all the important bodies on the car—that is to say, the passengers, their luggage, heavy spare parts and tools—should be as near as possible to the general center of gravity. It is possible at the present day to make a car with a soft suspension, or, at any rate, greatly better a harsh car.

British Army Taking Up Motor Transportation

By the conversion of the present horse-drawn system of transports into a series of completely equipped motor supply trains the heads of the War Department expect to simplify the organization of the transportation service of the Expeditionary Force. An epidemic of motor car inventions has struck England during the past six months.

THE British Army Service Corps is making a decided move in the direction of mechanical transportation, as the outcome of a number of years of experimental and development work. It is intended to convert the major part of the administrative transportation of the Expeditionary Force, both as relating to supplies and ammunition, into self-propelled transports. By the adoption of this method it is argued that a radical simplification in the organization of these services in the field will be wrought simultaneously. An epidemic of inventions relating to the motor car marked the first six months of the present year in England. These included solidified petrol; a type of coal-fuel engine; new kinds of valve gears, built "without seriously threatening the standard practice;" and a rotary steam engine. The inventor of this engine claims for it a really novel feature, which, he says, may be considered as endowing it with a chance to figure seriously in the evolution of the automobile. He declares that a signal virtue of the motor is the abolition of change-speed gears; the second advantage is found in a reduction of friction; and the third in the increase of steam tightness, the rotor bearing against two roller bearers, which in turn are freed from friction to some extent by being held up to their work by a steam cushion. That is to say, each roller bearer is made a floating fit in its own tunnel, while steam is admitted to a recess on the side of the roller, away from the rotor. Except for these features and the fact that it is constructed to run as a turbine when greater power is wanted, the engine in question does not appear to differ radically from the type of some other engines that made their appearance years ago.

"DOING" THE CHATEAU SECTION IN AUTOMOBILES.—One concern in France is carrying passengers through the Château section of the country by automobile, the journey occupying six days, going and returning. The fare is 500 francs. Starting from Paris, the first day's run is to Chartres, the second is to Tours, the third embraces the vicinity of Tours, the fourth day leads the tourists to Blois, the fifth is passed in and around Orleans and on the sixth day the motor car fetches its passengers back and puts them down in Paris.

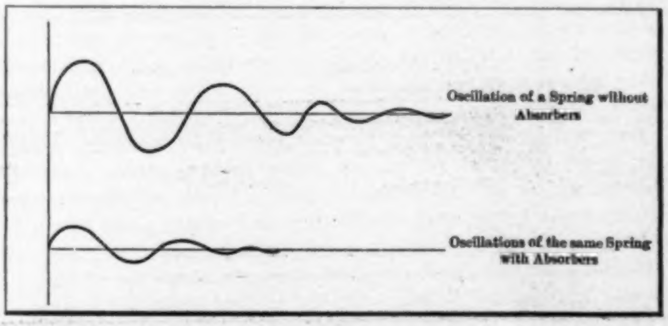


Fig. 5—Diagram showing the difference in the effects of a spring with and without shock absorbers

Discussing Brick for Pavement

Detailing the Vogue of the Best Results

Will P. Blair, Secretary of the National Paving Brick Manufacturers' Association, illustrates and discusses the ramifications of brick pavement, presenting the ideas which should be uppermost at the time of laying pavement of this type, and offering suggestions that should be of interest to the automobilist, enabling him to intelligently advocate the building of good roads.

IN order to better understand the suggestions here offered a cross section is given by way of illustration. (See Figs. 1 and 2.) It will be noticed that the improved portion, including the ditch, occupies a width of 47 feet, so that at least 50 feet right of way is required for a like road. This is a type that has become very popular in northeastern Ohio. We give first attention to the manner and method of construction and the reason therefor, under the belief that the why should be known to the automobilist with as much reason as he should know why any part of his machine is made in this or that way. It is the advantage that appeals for favor, so right methods should persuade their use.

To assist drainage and avoid danger of heaving by frost, the concrete curb is made in form so that the base shall rest upon a sub-base of gravel, broken stone or cinders.

For draining the road bed in most soils, a small tile, laid parallel with the curb with T outlets at intervals of every 10 feet will answer; if, however, the soil is of such character that the water by capillary attraction fills to the uttermost, then to avoid frost action incident to our more northern climate, it is necessary to tile the road bed alternately as illustrated in Fig. 3.

Drainage is thereby assured quickly, avoiding the possibility of the ice obstructing the water, as often happens with lengthy drains, stopping the flow of water altogether.

The top of the curb shall be flush with the top of the pavement, so that the water will run off the pavement with even distribution at the lower edge, and therefore not liable to destroy the berme. After excavating to the required depth, care should be taken to compress the sub-foundation, rolling with a roller not exceeding 5 tons in weight. The surface should be made to conform to that of the finished street. The base should now be put in of concrete, using Portland cement 1 part to 8 of gravel or broken stone and sand. The gravel and broken stone should have enough of the smaller sizes which, with the sand, will fill the voids and assure such a mixture after the water is applied as can readily be brought to a smooth surface conforming to the grade of the finished street.

Unless made smooth, the next step, that of preparing the sand bed and providing for a space along the curb for the expansion cushion, is scarcely possible. The sand should be spread by the aid of a template, and compressed to a uniform cushion by a hand roller weighing 300 to 350 pounds. This cushion should be uniformly two inches in thickness and thoroughly compressed. The support of the wearing surface will then be uniform under each brick, giving sufficient relief from the vibrations caused by the impact of travel, so that the cement filler subsequently applied will not shatter, and yet be a support that will greatly resist the weight of any load and prevent the filler bond from breaking and the brick from chipping. The expansion cushion should be put in last of all, but provision should follow the completion of the sand bed by placing a board along the curb, at least an inch in thickness for 14-foot roadway, and thicker for a wider road. This board should be made into two strips as shown in Fig. 4, held away from the curb by a piece of hoop iron hung over the boards, the longer end dropping behind the boards, so that when the time comes to remove the boards it may be readily accomplished by first taking out the hoop iron.

This board should remain in place until the road in all other respects is finished. The brick should be distributed along the line of work and piled outside the track which is being paved, taking the greatest care to protect them against mud and dirt. They should be laid on the bed thus prepared at right angles with the street, with the best edge uppermost, and as nearly as possible so the jointing line will cover the center line of each alternate row. Bats should then fill the end openings. The important matter in this work is that the brick shall be placed best, or face, edge up in the first instance, not only making a smooth surface, but avoiding a second operation in the work which disturbs the uniformity of the sand cushion. The surface should then be swept clean of spalls and dust and rolled with a steam roller, weighing not more than 5 tons, rolled until the unevenness in the surface is rolled out, rolling both by moving the roller at right angles and at 45 degrees.

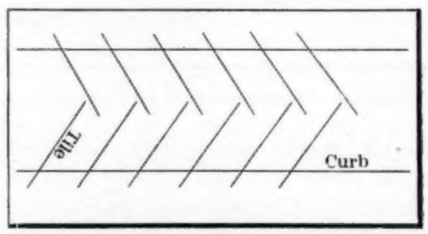


Fig. 3—Showing the diagonal courses of the pavement

The next operation, that of applying the filler, is too often regarded as of minor importance, and details necessary to insure a perfect and durable pavement are ignored altogether, and while inexpensive and easy to comply with, a disposition to carry out in full the details is necessary or it will not be done.

The filler should be composed of one part each of clean, sharp sand and Portland cement. The sand should be dry. The mixture, not exceeding one-third of a bushel of the sand, together with a like amount of ce-

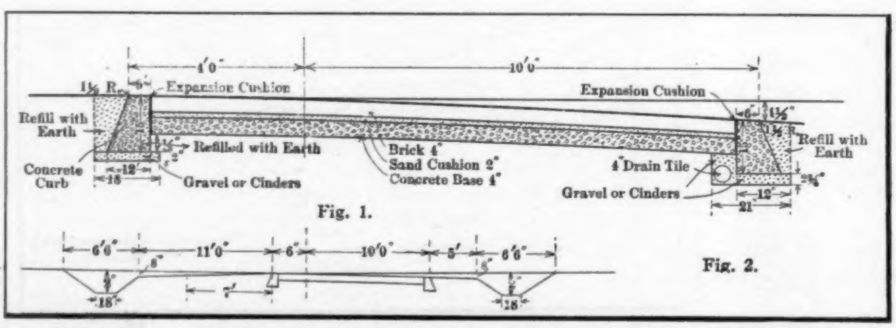


Fig. 1—Section of a brick-paved street showing the details of construction. Fig. 2—Dimensional information related to Fig. 1

ment, shall be placed in the box and mixed dry, until the mass assumes an even and unbroken shade. Then water shall be added, forming a liquid mixture of the consistency of thin cream.

The side and edges of the brick should be thoroughly wet before the filler is applied by being gently sprinkled.

From the time the water is applied until the last drop is removed and floated into the joints of the brick pavement the mixture must be kept in constant motion.

The mixture shall be removed from the box to the street surface with a scoop shovel, all the while being stirred in the box as the same is being thus emptied. The box for this purpose shall be 4 feet 8 inches long, 30 inches wide and 14 inches deep, resting on legs of different lengths, so that the mixture will readily flow to the lower corner of the box, the bottom of which should be 6 inches above the pavement. This mixture, from the moment it touches the brick, shall be thoroughly swept into the joints.

Two such boxes shall be provided in case the street is 20 feet or less in width; exceeding 20 feet in width, three boxes should be used.

The work of filling should thus be carried forward in line until an advance of 15 to 20 yards has been made, when the same force and appliance shall be turned back and cover the same space in like manner, except to make the proportions two-thirds cement and one-third sand.

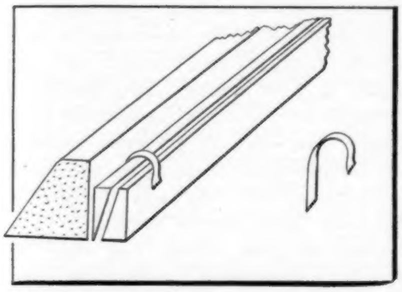


Fig. 4—Section through a curb, showing the expansion member

To avoid the possibility of thickening at any point there should be a man with a sprinkling can, the head perforated with small holes, sprinkling the surface ahead of the sweepers.

Within one-half to three-quarters of an hour after this last coat is applied and the grout between the joints has fully subsided and the initial set is taking place the whole surface must be slightly sprinkled and all surplus mixture left on the tops of the brick swept into the joints, bringing them up flush and full.

After the joints are thus filled flush with the top of the brick and sufficient time for hardening has elapsed, so that the coating of sand will not absorb any moisture from the cement mixture, one-half inch of sand shall be spread over the whole surface, and in case the work is subjected to a hot summer sun, an occasional sprinkling, sufficient to dampen the sand, should be followed for two or three days. Grouting thus finished must remain absolutely free from disturbance or traffic of any kind for a period of ten days at least.

After this comes the last operation in finishing the street, that of removing the expansion board along the curb and filling the space so as to allow for the expansion. For this purpose a pitch or asphaltum mixture that will retain the greatest elasticity during low temperature should be used. This will often prevent expansion cracks even by low temperature and unquestionably prevent them during seasons of high temperature. An illustration of this kind of road is here actually given in Fig. 5 from a photograph of the same.

With many roads even put to excessive use a less width for the paved portion will be found entirely sufficient. It will be noticed that in the type here given it is provided for a seven-foot graded track alongside of the paved portion. If a road of less width is chosen the graded earth portion should be at least seven or eight feet in width and the paved portion not less than nine

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More than 1,000 chauffeurs' licenses have been issued in the Province of Ontario. The driver's average wage is $60 monthly. It is an exceptional case in which a driver receives $20 per week.

Fig. 5—Reproduced from a photograph of a brick-paved boulevard

As to the Silent Chain

Apart from its quiet operation, the principal advantage of the silent chain lies in its flexibility, one of the most desired properties to be found in a mechanism. Liberal size and the best of quality as regards material will insure its success in operation.

NOW that silent chains are coming into use quite extensively, discussion is being entertained bearing upon the reasons why these silent chains afford an extra measure of advantage, and it is more than likely that the discussion will lead to a point that has been too frequently overlooked in the past. Flexibility is one of the most desired properties that can be found in a mechanism, and the advantage to be derived from its presence can no more fittingly be illustrated than to call attention to a fact that a locomotive may pull as many as 100 freight cars, gaining speed from a standstill, under the conditions under which freight cars are built, taking advantage of a spring coupling, thus making it possible for the locomotive to start one freight car at a time, which is all that it does. Were the freight cars in rigid relation with each other it would be utterly impossible for a locomotive to start even a small part of the cars that compose a train under ordinary conditions. The secret lies in the flexibility that is induced by the spring bumper, and, come to think of it, the amount of play that is permitted by the bumpers is very slight indeed. The silent chain as it is being employed in automobile work has all the properties of the spring bumper that serves so efficaciously in freight train work, and it is fitting that advantage should be taken of this condition in favor of flexibility, since it is being found in practice that there are almost no disadvantages at all. The chances for mistakes are in the direction of using chains that are too small for the work to be done. A well-made silent chain is a relatively expensive device, and the influence would naturally be in favor of some method that would have a favorable influence upon the cost of the application of these chains. There are only two ways of reducing the cost of applying silent chains, one of which has for its basis the use of an inferior product, and the second idea is coupled up to the use of a well-made chain of a reduced size, considering the work to be done. It is not possible for a designer of acumen to take advantage of these ways of reducing cost, and the ultimate success of the whole project lies in the use of liberal-sized chains, leaving the quality above suspicion.

What Some Subscribers Want to Know

Strong Desire to Get Out of Tire Troubles

Editor The Automobile:

[2,747]—I would appreciate an answer to these questions: (1) How can I remedy the following: I have a quick detachable straight-side tire, the bead of which has been stretched by allowing it to run flat. I have continuous trouble with these tires on account of their pinching or blowing out under the bead. I have tried wrapping tape around the rim, which, although it helps some, is not an absolute success.

(2) I have a Mitchell Model L 1909 car which has given me trouble by the rapid wear of the cones and ball bearings. When I take a wheel off to examine it I find the cones badly worn on the under side. After replacing with new cones and ball bearings I soon find them in the same condition, making, while running, a noise similar to the sound of the speedometer gears on the average car, although I pack the bearings with grease every month or so and see that they are properly adjusted. If you can give me any advice as to how to remedy this trouble it will certainly be appreciated.

(3) When the differential on this same rear axle is packed with grease why should it leak out around the brake bands or drums? A. V. M.

White Hall, Ill.

(1) The trouble in the tire is no doubt due to insufficient inflation or, perhaps, to a leak which takes place after a certain pressure has been attained. The pinch will take place at the top of the wheel if the car is standing or running with the tire flat. The accompanying illustrations (Figs. 1 and 4) will show the position taken by the tire at the top and bottom of the wheel when not pumped to the required pressure. The remedy is obviously to maintain the tire pressure required by the weight of the car.

(2) If the bearing is not adjusted too tightly, a trip to the repairman would probably be of benefit, as there may be something out of alignment. A little play should be allowed in the bearing so that after spinning the wheel it will finally come to rest with the tire valve at the bottom.

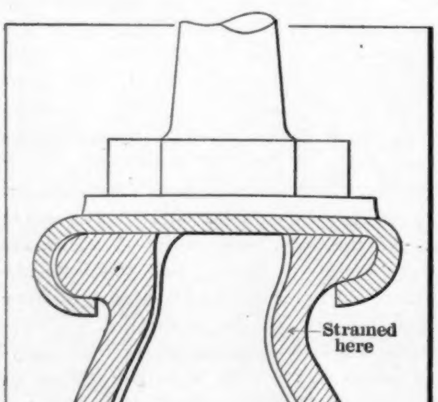


Fig. 1—Soft tire at the bottom of wheel being subjected to a severe bending stress

(3) This tendency of leakage of the oil from the differentials into the brake drums is a common occurrence with a large number of cars. On the latest models the makers are using some device such as a baffle ring to prevent it.

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith.

Another View of the Situation

Editor The Automobile:

[2,748]—In your issue of June 22nd, under the heading of "Short Stories of Common Interest," I note your article on "Lubrication," in which the lubricating oil is mixed directly with the gasolene. I have very carefully watched, during the last several months, these articles, especially as they have been explained by Charles E. Duryea, and your answers thereto. Now, I cannot see how anybody could have misconstrued the meaning of this method of lubrication, for I am sure that Mr. Duryea frequently mentioned that its adaptation was only suited for two-cycle work. He did, however, in several articles, state that by adding a very small quantity of lubricating oil to the gasolene the running qualities of any four-cycle motor would be greatly improved. This I know to be true, as I have tried this method and am using it at the present time. I am sure he did not recommend this system for four-cycle work, to be relied upon as the sole method of lubrication. It was his contention that it would improve the running of the engine and meant that the regular method of lubricating should be employed as each maker originally provided.

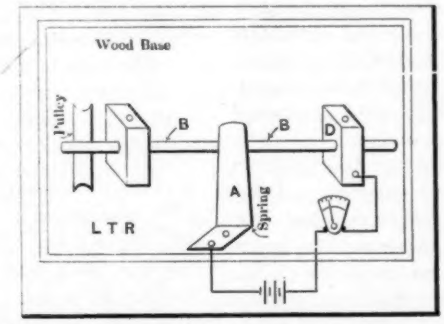


Fig. 2—Apparatus devised to test the presence of oil film between shaft and bearings

Now in regard to the two-cycle lubrication in this manner, I must advise that my business relations have been such that I have had the honor of calling upon the majority of the two-cycle engine manufacturers and I find that where any of them have ever tried this method they are still using it and their enthusiasm in recommending this style of lubrication is great.

Recently a friend of mine brought up the question of this style of lubrication and also of Mr. Duryea's talks, and he assured me that he used this system on several thousand engines, and that he found it to be without any question the most superior method he ever tried, and his experience covers at least nine years. He also advised me at the time that he would appreciate having his method of oiling brought to your notice. Disregarding all theoretical and technical arguments to the contrary, this sort of evidence would be most convincing to most of us and, to use Mr. Duryea's own language, I would say that "Facts are stubborn things."

Further in your article you say, "Authoritative statements emanating from high sources relating to the lubricating problem all go to show that it is the duty of lubricating oil to furnish an unbroken film between the journal and the box." Regarding this statement, I beg to advise that while I do not claim to be of this high source of authority, I do claim that this is absolutely wrong, as the following simple experiment will show:

Most of us know that lubricating oil is a non-conductor of electricity, at least of currents of 25 volts or less; therefore, if a film of oil is maintained between a journal and a shaft no current would flow through the circuit shown in the accompanying Fig. 2, which sonsists simply of mounting two pieces of brass with holes drilled in shaft B to bearing D, then from the voltmeter to the opposite side of the battery. If the oil maintained the above-mentioned film it would certainly insulate the shaft from the bearing and no current would flow or at least the voltmeter would fluctuate, showing a broken or interrupted contact.

You may, no doubt, be surprised to learn that the meter shows a perfectly steady current passing through this journal, clearly disproving the fact that the shaft is not in absolute metallic contact. In this experiment we have a pressure on the shaft of a spring of possibly five or six ounces. Certain it is that if the film of oil is broken by this light pressure, in an explosive engine where the pressure on the

What Other Subscribers Have to Say

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith.

crankshaft becomes a number of hundred pounds, this argument of the oil film does not hold good.

The theory of the oil film has been handed down from one textbook to another and it seems that it has become a universally accepted term, just as some other theories have been allowed to pass from one generation to another. I have constructed the apparatus shown in the illustration for the sole purpose of verifying the authenticity of the argument.

I would not have answered the above article if it were not for the fact that I believe that Mr. Duryea's contentions are perfectly correct and that I happen to be in possession of this information, which is certainly authentic.

I earnestly trust that you will see fit to publish this in your valued journal, which is, to say the very least, an educational medium of the highest order.

LEWIS T. RHOADES.

New York, N. Y.

Coat the Driving Faces of the Coupling with Solder

Editor THE AUTOMOBILE:

[2,749]—I have been troubled a great deal by the rattling of the Oldham magneto coupling. I have tried everything I can think of to remedy this, but it still continues. Can you suggest some other form of coupling that I might make myself which would overcome this objectionable feature?

ROBERT DENTON.

Wellesley Farms, Mass.

A Knock in the Cylinder

Editor THE AUTOMOBILE:

[2,750]—Can you inform me what will stop a knock in the cylinders of my car? The knock seems to be a side lash from the pistons. Would you suggest reboring the cylinders, as the pistons seem to be in perfect order? WM. FISCHER.

Evansville, Ind.

If the piston itself is in proper order the knock is probably due to worn piston rings, which should be replaced. Another cause of knocking in the cylinders and one which is at times very hard to detect, is a loose wrist pin. If the cause of your trouble is neither of these two the remedy will lie as you suggest, in reboring the cylinders.

Wants Information on Timing

Editor THE AUTOMOBILE:

[2,751]—Could you give me any information on camshaft and magneto timing? I have taken the camshaft and magneto off my motor and wish you would give me the correct setting so that I can get these back into their respective positions. It is a four-cylinder motor with a Bosch magneto. A SUBSCRIBER.

Toronto, Canada.

The accompanying cut (Fig. 3) gives in graphic form the desired information. A very good practice is to put a center punch mark on the engine frame near the fly-

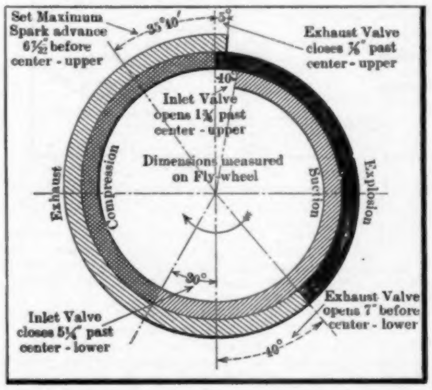


Fig. 3—Diagram for use in timing motors, giving the timing of a motor on a basis of flexibility of performance

wheel. Corresponding marks are put on the flywheel at each valve opening or closing and marked with the initials of the operation which takes place when the marks on the flywheel register with the mark on the casing. In this manner whenever the engine is taken down it may be assembled again without difficulty.

Trouble with the Coil

Editor THE AUTOMOBILE:

[2,752]—For some time I have been having trouble with the ignition on my car. After having searched for a long time I have finally located the cause of the trouble and find it to be in the coil, as every other part of the ignition system is perfect. Could you give me any advice as to how to make any adjustments which may be necessary? M. F. BRONSVELD.

Centreport, N. Y.

Your trouble is probably due to either a badly adjusted vibrator or the contact screw of the vibrator may be loose. If the former, it may be adjusted as follows: Turn the engine over slowly by hand until the contact is closed; then turn on the switch and see if the vibrator will buzz. It should vibrate so rapidly that the sound produced is a sort of humming or singing sound. If this is done and the motor runs all right on low speeds and misses on high, the adjusting screw is too tight and the trembler has not time to vibrate well in this condition. The screw should be loosened.

Has Compression Troubles

Editor THE AUTOMOBILE:

[2,753]—I have discovered leaks in the compression of at least one of the cylinders of my four-cylinder motor. I do not know what the cause of the leakage is or just where it occurs and would greatly appreciate any information you may give me as to how to proceed to remedy this. As I have plenty of time and a little mechanical ability, I would like to do it myself.

W. BOOTH.

Cairo, N. Y.

A good method to follow in testing for the location of compression leaks is to fill an oil can with water in which a small piece of soap has been dissolved, and pour this around every spot that a leak could possibly occur. An assistant should then turn the crank of the motor very slowly and all the spots into which the water has been poured watched for bubbles which will indicate a leak.

If no leaks are discovered in this way the valves should be ground with emery dust and oil, being finished with tripoli and water. If the leak has not been remedied after these processes the piston rings should be examined

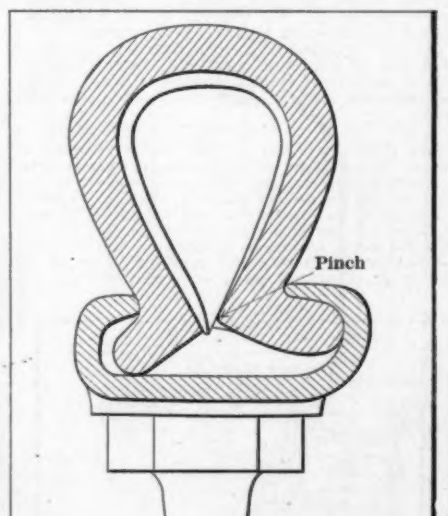


Fig. 4—Position of soft tire at top of wheel, showing how the inner tube is pinched

Meeting Recurring Troubles

Presenting a Series of the Most Probable Cases

A series of correlated short stories, accompanied by diagrams and characteristic illustrations, including the nature of the troubles that are most likely to happen to automobiles, discussing their causes and effects, all for the purpose of arriving at a remedy. It is the aim for the most part, to show how these troubles may be permanently remedied, and as a secondary enterprise it is indicated how the automobilist can make a temporary repair, thereby enabling him to defer the making of a permanent repair until a convenient time arrives.

Lubrication of the Knox Cars—The Knox cars are lubricated by the De Dion force-feed system. The oil is kept in constant circulation by means of a pump. This pump is of the gear type and is operated by means of a vertical shaft, driven directly off the cam shaft and operating not only the oil pump but also the spark timer.

The oil reservoir is in the lower half of the crankcase and forms an integral part of the engine casing. The oil level in the reservoir is never allowed to come so high as to permit the connecting rods to dip into the oil, as this would cause too much oil to be thrown into the cylinders.

The gear pump draws the oil from the bottom of the crankcase and forces it through a main feed pipe over to the opposite side of the motor. The main feed pipe runs into a longitudinal pipe, meeting it at the center of the engine, thus distributing the oil in two directions along the pipe. From this pipe the oil is led directly into the main bearings by means of leads tapped into it.

The crank cheeks and crankpins are drilled to form an oil channel, and the oil enters this passage through an opening in the crankshaft at the main bearing. It then finds its way, being driven by centrifugal force, up into the crankpin, which has an opening leading into the connecting rod bearing. The connecting rod is also drilled, forming an oil passage up to the wrist pin. Oil is admitted to the connecting rod oil passage once in every revolution, when the opening in the connecting rod registers with that in the crankpin.

The cylinders are lubricated by the oil spray which is thrown off the cranks. The surplus oil from all the bearings finds its way back to the oil reservoir, from where it is again drawn through the system after having passed through a strainer.

There is a spring connection device on the pumpshaft, which, in case the pump should in any way become clogged, will snap by, thus preventing breakage of the more delicate parts.

A pressure gauge is located on the sloping floor board. The pressure may be varied at will by means of an adjustable by-pass located on the left-hand side of the motor. The by-pass must always be partly open in order for the system to work properly and should in general be set so that the gauge registers about four pounds pressure in the pump. For extreme speeds it may be allowed to run up as high as eight pounds.

The oil is supplied to the tank on the left-hand side of the motor, on which side there is also a means of removing the strainer from the reservoir and a pet cock showing the oil level.

The National Uses a Circulating System—The oil in the National lubricating system is kept in continual circulation. The oil reservoir is located in the crankcase which is divided in such a way as to have an inner and an outer bottom. The outer or lower bottom carries the oil supply while the inner bottom is in reality a sort of tray inserted in the casting and moulded in so as to provide an oil trough below each cylinder.

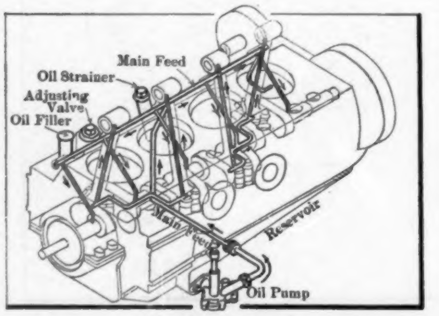


Fig. 1—The oiling system of the Knox cars, showing the course of the oil through the various leads by means of arrows

The connecting rods are equipped with scoop spoons which dip into the pools of oil which lie in each of these splash troughs. This dipping action throws the oil in the form of a spray into all the recesses of the crankcase and thoroughly lubricates all the moving parts located in the base of the motor.

To keep the oil in circulation there is a pump located within the crankcase which takes the oil from the reservoir in the base and forces it up through a sight-feed. After dropping through the sight-feed the oil returns by a vertical lead into the main oil pipe which runs the entire length of the crankcase and terminates in the lower part of the timing gear housing, which receives the oil in a small cup-like recess provided for the purpose. Some of the oil will be picked up by the timing gears and thus lubricate them, while the rest will overflow into the crankcase rapidly enough to keep the splash troughs full and overflowing. Above each of the crankshaft bearings

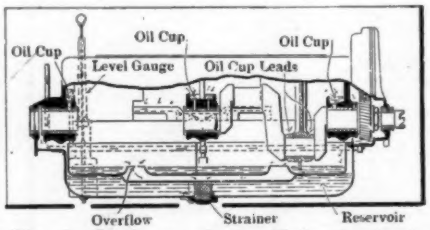


Fig. 2—Crankcase of the National, showing course of oil through the splash troughs and overflow pipes into the reservoir

there is also a cup which catches the oil from the splash and feeds it to the bearings through leads in the bottom of these cups.

All the oil draining off the bearings will join the overflow through the two standpipes provided, and return to the reservoir in the base. The course taken by the oil on its passage from the standpipes to the base leads through two pipes which join in the center of the base and then through an opening at the point of juncture of these pipes into a strainer of cylindrical form.

There is a level gauge on the side of the crankcase which shows at any time the amount of oil contained in the reservoir. This gauge is of the floating type with a ball located off the top of a vertical shaft projecting from the float. Drain plugs are provided in the bottom of the crankcase

Correja "35 A" Oiling Scheme—A combination of both the force-feed and splash systems is used on the Correja model "A" cars. The force-feed system is actuated by a pump which forces the oil to all the crankshaft, connecting rod and camshaft bearings. The pump is gear driven, being operated off the camshaft, and is located on the outside of the crankcase casting on the rear left hand side of the motor on the bottom.

The oil reservoir is in the bottom of the motor and carries the whole supply of oil. The pump lifts the oil from the bottom of this reservoir and carries it through leads to the various bearings mentioned above. After lubricating these bearings the oil will drain down into the splash troughs in the bottom of the crankcase. These splash troughs rest on a sort of tray above the oil reservoir.

The bearings supplied by the force-feed system will be given a greater supply of oil than can possibly be used by them, hence there will be a continuous overflow into the splash troughs which then become over supplied in turn, causing an overflow into the reservoir through the overflow holes provided for this purpose.

The connecting rods, even when running at a slow rate of speed, will descend into the troughs with sufficient momentum to dash the oil into a flying capor which completely fills the crankcase. This oily vapor will lubricate all the bearings not taken care of by the force-feed system.

The oil reservoir is filled through the breather tube. When the cover of the breather tube is removed the oil is poured down through the strainer

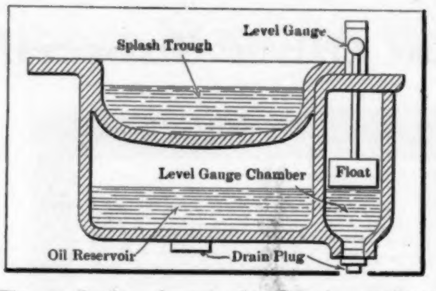


Fig. 3—Section through the Correja crankcase, showing the splash troughs and float level gauge

placed in the filler opening. There is a float level gauge on the side of the crankcase by means of which the amount of oil in the reservoir at any time may be determined by the operator.

The level gauge rests in a projection which is part of the crankcase casting. Beneath the projection carrying the float gauge there is a large drain plug. The oil level in the tank should never be allowed to sink so low that the little ball in the level glass is out of sight. It should be kept at about two inches from the bottom. As is necessary in a system of this kind, where the same oil is passed through the motor over and over again, a thorough system of straining is installed, the strainers being located in two places, viz., where the oil is supplied to the reservoir and again where it enters the pump.

In the Lubrication of the Bergdoll "30"—The Bergdoll 30-horsepower 4-cylinder motor is lubricated by the splash system. The crankcase is divided into four splash troughs into which the connecting rods dip. Besides being divided laterally to form the splash chamber the crankcase is also divided horizontally in such a way that the casting has a double bottom. The upper bottom is moulded in such a way as to form the splash troughs just described. Below the troughs in what may be called the lower bottom of the crankcase the oil is carried in a plain basin-shaped reservoir.

The reservoir in the bottom of the aluminum crankcase casting is filled through the breather pipe. In filling, the cover of the breather is removed, disclosing the filler opening equipped with a strainer. The upper test-cock on the side of the crankcase is left open while filling and oil is poured into the filler hole until it starts to flow from the cock. The cock is then closed tightly. The lower test cock is for the purpose of draining the reservoir, the oil never being allowed to become so low that there will not be a flow from this cock. The breather pipe is located on the exhaust side of the motor, just behind the magneto shaft. The oil is drawn from the reservoir by a pump which takes the oil from a suction pipe leading to the pump from the rear end of the exhaust side of the motor. The oil is then forced up through a vertical lead into the sight-feed located on the dash. Thence the oil flows down onto the opposite side of the motor and is lead into the crankcase at the forward end. The oil from this lead will fill the front splash trough and then overflow into the second and from there to the third and so on to the rear. After reaching the correct level in the rear splash trough, the oil overflows back into the reservoir through an overflow in the rear of the crankcase.

Since the oil supplied by the pump is in excess of the quantity necessary to form the splash it will be continually overflowing back into the oil reservoir, thus keeping up a constant circulation. So that a pure supply of oil will be insured to the pump a strainer is inserted in the system just before the pump through which all the oil must pass. The pump itself is located on the rear end of the exhaust side of the motor and is driven off the camshaft by means of gears.

The connecting rods dip into the oil while revolving and throw the oil in the form of a mist or vapor up into the engine, lubricating the entire motor, including cylinder walls, connecting rods, camshaft and main bearings. All these bearings will be oiled by the mist and in fact will receive an excess which will drain back eventually to the crankcase reservoir and be carried again through the system.

Vacuum Oiling System of the E. M. F.—The E. M. F. "30" car is lubricated by an en-

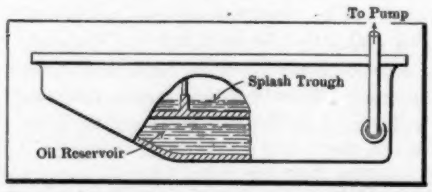


Fig. 4—Illustrating the oil pan casting of the Bergdoll with the lead to the oil pump

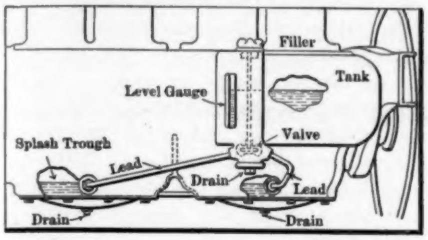


Fig. 5—E-M-F vacuum feed lubricating system, showing tank, level glass and leads to splash troughs.

tirely self-enclosed and automatic vacuum-feed splash system.

The oil tank is an integral part of the crankcase and is located on the left hand side of this casting. The capacity of the reservoir is about one gallon. The tank is filled through an opening in the forward end which is covered by a screw cap so made as to screw down tightly so as to form an air-tight fit over the oil reservoir. This tightness is an absolute necessity to the system as will be seen later.

The oil is fed into the crankcase splash troughs by vacuum. Two feed pipes extend from the bottom of the tank into the crankcase. These pipes are U-shaped, one end leading into the bottom of the tank, while the other projects through the bottom of the crankcase, to a point about five-eighths of an inch above the bottom. When there is no oil in the crankcase, but the reservoir is full, it can readily be seen that there will be a flow from the reservoir into the crankcase by means of these two pipes. When there is sufficient oil in the crankcase to cover the pipe ends, they will be sealed so that no air can enter them and hence no more oil may flow out of the reservoir.

This system automatically supplies the oil that is used just as rapidly as it is needed and keeps the oil level constant, since the pipes are continued into the crankcase for just such a distance as to provide the correct level for the splash of the connecting rods. The oil cannot rush into the crankcase and flood it when filling the tank as there is a valve which closes automatically when the screw cap is removed. There is an opening directly under the valve in the bottom of the oiler, through which the valve may be taken out for inspection in case of leakage. Any leakage would be detected while filling the reservoir.

The splash of the connecting rods throws a spray up into the cylinder and fills the crankcase with oil vapor. This oil vapor lubricates the entire motor, including the camshaft.

The camshaft gears are lubricated through an oil hole and by means of grease cups which are provided for this purpose.

In order not to waste oil certain precautions must be observed in the monthly cleaning to which the crankcase should be submitted. The filler hole cap on the oiler box must be removed so that the oil does not pour into the crankcase. The drain in the bottom of the crankcase is then opened until all the oil has poured out, when the drain cock is closed. Kerosene should then be poured into the breather pipes and the motor allowed to run for about fifteen seconds. The drain cock is then opened and the kerosene allowed to run out. After the drain cock is closed and the filler hole cover screwed firmly back into place the oil will run into the crankcase until it reaches its proper level.

Self-Contained System of the S. G. V. 20-30 Car—The lubricating system on the S. G. V. 20-30 is absolutely self enclosed. The machine is lubricated entirely by the force-feed system, although by adding a gallon more oil to the supply an auxiliary splash could be obtained. For all the requirements of the ordinary automobilist, however, the system is fully adequate as it stands.

The oil is carried in the base of the motor in a reservoir which forms an integral part of the crankcase casting. This reservoir is filled through an opening which is located just above the rear left hand crankcase supporting arm. To fill the crankcase the screw cap which covers the filler opening is removed and the oil poured into the strainer which is located inside the filler opening to remove the foreign matter which is some times found to be in the oil supplied by the dealers, in spite of all the precautions taken to prevent such an occurence.

In filling the reservoir, the cock on the side of the crankcase is left open. This cock is just at the correct oil level so that there will be no splash of the connecting rods into the oil as this would cause the motor to smoke since a sufficent quantity of oil is supplied to the motor by the force-feed system. In case of a splash there would be too much oil supplied and there would be danger of fouling the motor.

The oil is drawn from the crankcase reservoir by means of a suction pipe, and taken up to the gear pump which is located on the rear end of the camshaft. The pump then sends the oil under pressure to the main bearings where it enters the crankshaft after having lubricated the bearing. The pressure that is given by the pump is sufficient to overcome the centrifugal force at the main bearings and send the oil well along on its way to the cranks. The cranks are also drilled to provide an oil channel and the oil will be thrown through them by the force due to the rotary motion of the shaft. There is an opening in the crankpin through which the oil flows and lubricates the connecting rod bearing at this point.

The centrifugal force at the crankpins will force the oil up the leads in the connecting rod to the wristpin whenever the opening in the crankpin registers with the opening in the wristpin lead. At other times the oil will be thrown off the connecting rod bearings in a spray, thus lubricating cylinder walls.

There is a pressure gauge on the dash which shows the pressure on the pump.

The amount of oil supplied to the various bearings depends on the speed of the motor; an adjustment may be made, however, to regulate the amount of oil which will flow for any speed by means of an adjustable plunger on a by-pass through which the oil flows from the crankcase on the side of the motor. By increasing the tension on the spring which holds the plunger, the plunger can not be pushed back so far by the oil pressure, hence there will not be so large an opening for the oil to pass through, and the quantity will be diminished. In order to increase the supply at any speed the method of procedure is, of course, directly opposite.

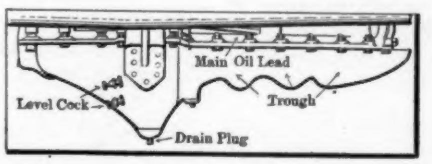


Fig. 7—View of the lower part of the Ford crankcase casting, showing the exterior of the splash troughs and the flywheel casing

The other bearings throughout the car are attended to in the usual manner by means of compression oil cups and oil holes. The transmission and differentials run in oil.

If the car has not been used for some time and the pressure gauge registers no oil pressure when the car is started, the priming cock on the top of the pump should be opened and a little oil poured in.

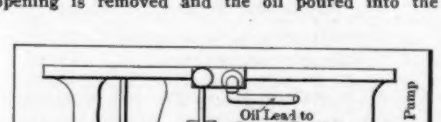


Fig. 6—The crankcase of the S. G. V. car, illustrating the oil well in the rear end to provide suction for the pump

Lubrication of the Ford Cars—The Ford cars are lubricated by the splash system, the oil being kept at constant level by means of a circulating scheme keeping the oil constantly in motion.

The oil is carried in the bottom of the crankcase and also in the lower part of the flywheel casing, which is made oil tight by extending the cover plates of the crankcase so as to include the flywheel.

The flywheel proper consists of a number of permanent magnets arranged in a circle. These magnets form paddles which, when the flywheel is revolving rapidly, churn the oil in the bottom of the oil well into a vapor and lift it up into the upper part of the casing. Near the top part of the flywheel cover there is a funnel from which a pipe is carried through the crankcase and into the front end of the oil pan casting.

The oil pan casting is divided into a series of troughs, which are moulded into the aluminum casting which forms this part of the engine. The pipe from the funnel leads directly into the foremost of these troughs. The walls of the troughs are all cast high enough to provide the proper level for the splash system to overflow when the oil rises high enough.

When starting on a trip the oil pan is filled to the level of the top of the trough walls and the flywheel casing is also filled to the level of the upper test cock, of which there are two located in the casing. The oil is poured in through a cup-shaped opening provided with a screen. It flows into the oil pan, down into the first trough, then, as more is poured in, it will overflow each successive trough wall, finally draining back to the flywheel casing. The top test cock is left open and oil is poured in until there is a flow from this test cock. The lower test cock is placed at the minimum permissible level.

The connecting rods splash into the troughs throwing the oil up into the cylinders, lubricating the walls and the wristpin. The camshaft is also lubricated by the splash. The excess oil drains back to the oil pan and flows gradually back to the flywheel casing.

There is a lead from the flywheel casing into the timing gears. The flywheel casing is also provided with a drain plug by means of which it may be emptied. The transmission and clutch are lubricated by the spray from the flywheel while the fanshaft and other bearings are provided with grease cups. The differentials and axle bearings are packed in grease.

Ohio System Contained in Crankcase—The Ohio motors are lubricated by a system which is contained almost entirely in the crankcase. The oil reservoir which holds about a gallon of oil is located in the lower half of the crankcase. The oil may be put into the reservoir in two ways: by pouring it through the breather tube or into the filler pipe which is located on the side of the motor.

Within the base of the crankcase and extending vertically there is a plunger pump, driven by means of an eccentric off the camshaft. This pump takes the oil from the base of the reservoir through a strainer tube projecting laterally into the reservoir and forces it up into the upper part of the lower half of the crankcase. This part of the crankcase contains a number of troughs into which the oil is fed by the pump in sufficient quantities to keep them constantly filled to such a height that a proper dip of the connecting rod into the oil will take place.

There is one of these troughs to each cylinder. As the rapidly revolving connecting rods are whirled into the oil pools contained in the splash troughs they churn the oil into a vapor which fully envelops the crankcase and lubricates every moving part contained therein. This includes the cylinder walls, connecting rod bearings, main bearings, camshaft bearings and cams.

After lubricating all the bearings the oil will drain back into the bottom of the crankcase and will pass through the system again, after being strained. A constant level throughout the crankcase maintained by means of partition walls placed laterally across the crankcase between each pair of cylinders.

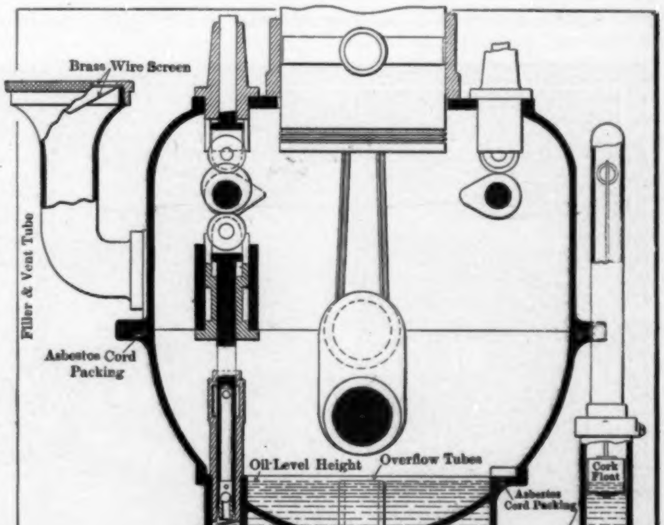


Fig. 8—Illustrating the interior of the Ohio crankcase. The pump, splash trough and reservoir are shown herein

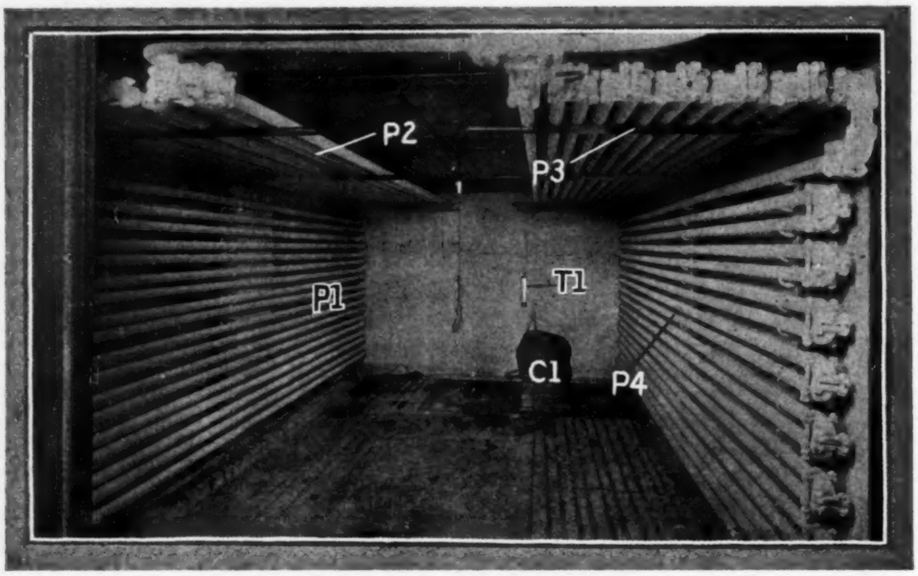


Fig. 1—Inside of the refrigerator used for testing carbureters, showing the banks of refrigerating pipes, with a coat of frost all over their surfaces

Wheeler & Schebler Testing Equipment Discussed

Illustrating the freezing equipment that has been installed in the plant of Wheeler & Schebler at Indianapolis, Ind., for use in the testing of carbureters under varying conditions of temperature.

WHEN watches were first made it was found that they would not operate satisfactorily under varying conditions of temperature, and in the course of time a system was contrived for the adjusting of watches under conditions of heat, cold and position. It is a far cry from a watch to a carbureter in many ways, but there is no difference between watches and carbureters from the heat, cold and position point of view.

It was the idea of George Schebler when he built his first carbureter to so place the float that it would regulate the flow of gasoline to the nozzle, independent of position, taking into account the fact that when an automobile is going up or down a hill the "hydraulic grade" is disturbed from the level, and the flow of gasoline is accelerated or retarded accordingly, thus introducing a serious disturbing element, and Schebler thwarted the designs of this disturbance by placing the carbureter float concentrically with the nozzle.

A further study of the carbureter problem brought to Messrs. Wheeler & Schebler the idea that carbureters should be adjusted for heat and cold while they are being tested in the plant, taking occasion to make any changes in design that might be suggested by the use of suitable testing equipment, involving the questions of temperature. It was quite apparent that nothing substantial could be gained by them in these directions in the absence of a refrigerating plant, and Fig. 1 shows the interior of the refrigerating room with banks of piping P1, P2, P3 and P4 around the sides and upon the ceiling of the room with a thermometer T1 in the vicinity of the rollers, which are connected with a dynamometer located in the adjoining room. The walls of the room are suitably insulated, conforming to the customary practice in cold storage plants, and the equipment employed for the purpose is shown in Fig. 2, consisting of a compressor C1 driven by an electric motor with a controller C2, power being delivered from the motor by means of a silent chain in the manner shown in the illustration.

The refrigerating liquid enters the system through container C3, and a bank of condenser pipes C4 is placed on the side wall of the refrigerator R1, access to which is had by means of the double doors D1. The expansion valve V1 controls the flow of the refrigerating liquid after it is compressed and cooled and freezing starts at this point, delivering the expanded refrigerating medium through the pipe P1 to the bank of pipes within the refrigerator as referred to in Fig. 1. After the refrigerating medium passes through the bank of pipes within the refrigerator and its temperature is raised due to the absorption of heat from the chamber, it passes back to the compressor, where a new cycle of work begins.

The refrigerating equipment above described is contrived on a basis of flexibility, thus permitting the temperature of the refrigerated room to be varied over a wide range at will, and to reduce the temperature of the room to 10 or 12 degrees below frost is a fair possibility, thus making it easy to test carbureters under the conditions of cold as they obtain in the North in the Winter time, varying the same to the heat of the tropics through all the degrees of temperature represented in this wide range.

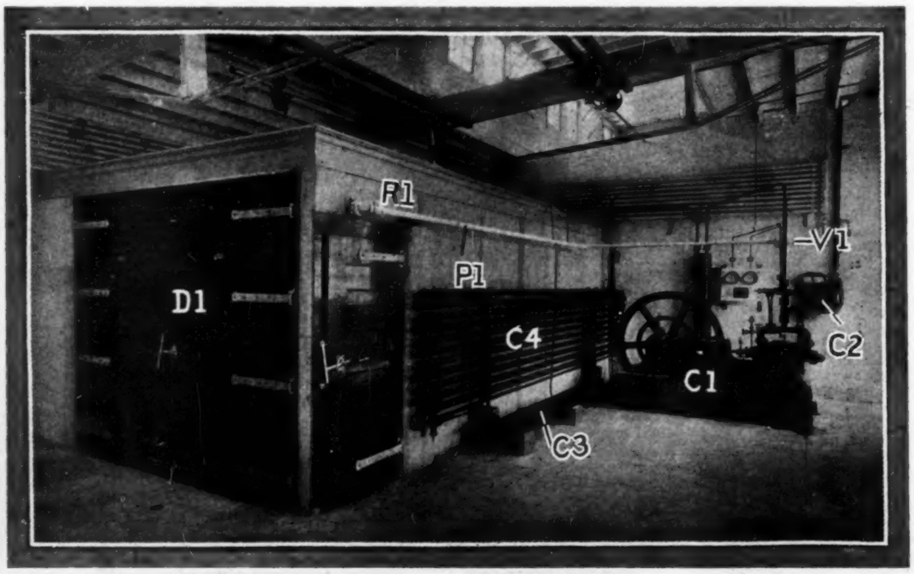


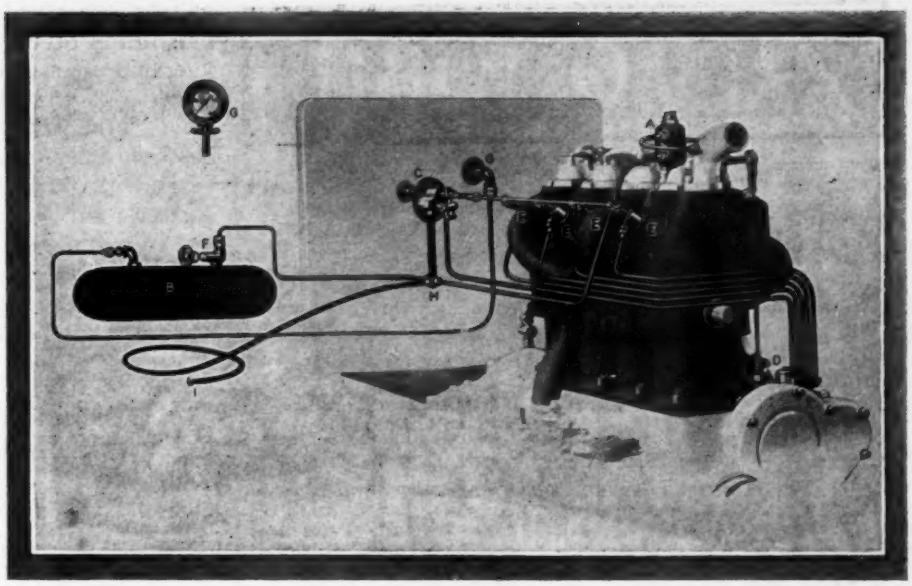
Fig. 2—Showing the compressor, condenser, method of driving the compressor, and scheme of piping the refrigerating medium into the refrigerating box

Chalmers Has Self-Starter

Illustrating and describing the self-starter that is being introduced by the Chalmers Motor Company, of Detroit, Mich., as a feature of 1912 Chalmers automobiles.

THIS starter is on the air pressure basis, the air being carried in the tank B with a capacity for air at the required pressure sufficient for the need. A check-valve A in the head of the No. 1 cylinder is responsible for the supply of air under pressure to the tank B which is carried beneath the body, supported

by the chassis frame. Control is by means of a dash-valve C which releases the air from the tank B, piping being provided to carry the air as released to the distributor D, delivering the same in proper time to the respective cylinders of the motor for self-starting purposes. It is the function of the distributor to deliver the compressed air to the cylinders that are ready for the working stroke in their order of firing. Cylinder valves E, one for each cylinder, afford the means for the entry of the compressed air under the control of the timer to the respective cylinders. A shut-off valve F is placed at the tank B, and a pressure gauge G serves as a tell-tale, enabling the operator of the car to observe the condition of the tank from the pressure point of view. For purposes of inflating tires a valve H is cut into the system and a length of hose is provided with a tire-end inflater I at the extremity, thus completing the equipment. In a word, the motors as provided with this self-starting system operate as compressed air motors for a sufficient time to permit the gasoline equipment to get under way in case it does not respond to the first few revolutions.



Diagrammatic presentation of the Chalmers compressed air self-starter as used on 1912 Chalmers automobiles

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Beer and Chauffeuring Do Not Mix in London—Automobile owners in London are in a ferment over the subject of "Chauffeurs and Public Houses." An alarmist has appeared in print with the statement that "a drunken motor driver is surely more dangerous than an intoxicated constable on duty, yet the latter is forbidden by law to drink in a public house, while the former can drink where and when he will. Many serious street accidents just lately have been due to intoxicated chauffeurs in charge of cars. Such mishaps could never have occurred had a little less liberty been given the drivers as regards the liquor they imbibed. Not that motor car drivers are all drunkards; but car driving, especially in London's congested streets, demands absolute sobriety to be at all safe. It would not be a bad plan to prohibit public houses from supplying intoxicants to uniformed motor car drivers when they are on duty."

Calendar of Coming Events

Handy List of Future Competitive Fixtures

Race Meets, Runs, Hill-Climbs, Etc.

July 5-22..........Winnipeg, Man., Fourth Canadian Competition for Agricultural Motors.
July 17-22.........Milwaukee Reliability Run, Wisconsin State Automobile Association.
July 20-28.........Minneapolis Reliability Run, Minnesota State Automobile Association.
July 22...........Guttenberg, N. J., Track Races.
Aug. 3-5...........Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 4-5...........Brighton Beach, N. Y., Twenty-four-Hour Race.
Aug. 7.............Chicago, Ill., Commercial Reliability Run, Chicago *Evening American*.
Aug. 12-18.........New Orleans-to-Memphis Good Roads Tour, New Orleans *Picayune*.
Aug. 12...........Philadelphia, Reliability Run, Quaker City Motor Club.
Aug. 12...........Worcester, Mass., Hill Climb, Worcester Automobile Club.
Aug. 17...........St. Louis, Mo., Reliability Run, Missouri Automobile Assn.
Aug. 25-26.........Elgin, Ill., Stock Chassis Road Race, Chicago Motor Club.
Sept. 1............Oklahoma, Reliability Run, *Daily Oklahoman*.
Sept. 2-4..........Brighton Beach, N. Y., Track Races.
Sept. 4............Denver, Col., Track Races, Denver Motor Club.
Sept. 7-8..........Philadelphia, Track Races, Philadelphia Auto Trade Association.
Sept. 7-9..........Hamline, Minn., Track Races, Minnesota State Automobile Association.
Sept. 12-13........Grand Rapids, Mich., Track Races, Michigan State Auto Association.
Sept. 15...........Knoxville, Tenn., Track Races, Appalachian Exposition.
Sept. 16...........Syracuse, N. Y., Track Races, Automobile Club and Dealers.
Sept. 18-20........Chicago, Ill., Commercial Reliability Run, Chicago Motor Club.
Sept. ....Denver, Col., Track Races, Denver Motor Club.
Oct. 3-7...........Danbury, Conn., Track Races, Danbury Agricultural Society.
Oct. 7.............Philadelphia, Fairmount Park Road Race, Quaker City Motor Club.
Oct. 9-13..........Chicago, Ill., Thousand-Mile Reliability Run, Chicago Motor Club.
Oct. 13-14.........Atlanta, Ga., Track Races.
Oct. 16-18.........Harrisburg, Pa., Reliability Run, Motor Club of Harrisburg.
Nov. 1.............Waco, Tex., Track Races, Waco Auto Club.
Nov. 2-4...........Philadelphia, Reliability Run, Quaker City Motor Club.
Nov. 4-6...........Los Angeles-Phoenix Road Race, Maricopa Auto Club.
Nov. 9.............Phoenix, Ariz., Track Races, Maricopa Automobile Club.
Nov. 9-11..........San Antonio, Tex., Track Races, San Antonio Auto Club.
Nov. 27-30.........Savannah, Ga., Vanderbilt and Grand Prix Races, Savannah Automobile Club.
Nov. 30............Los Angeles, Cal., Track Races, Motordrome.
Dec. 25-26.........Los Angeles, Cal., Track Races, Motordrome.

Foreign Fixtures

July 21-24.........Boulogne-sur-Mer, Race Meet.
Aug. 6.............Mont Ventoux, France, Hill Climb.
Sept. 2-11.........Roubaix, France, Agricultural Motor Vehicle Show.
Sept. 9............Bologna, Italy, Grand Prix of Italy.
Sept. 10-20........Hungarian Small-Car Trials.
Sept. 16...........Russian Touring Car Competition, St. Petersburg to Sebastopol.
Sept. 17...........Semmering, Austria, Hill-Climb.
Sept. 17...........Start of the Annual Trials Under Auspices of *l'Auto*, France.
Oct. 1.............Gaillon, France, Hill-Climb.
Oct. 12-22.........Berlin, International Automobile Exhibition.

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The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

WHEN the users of automobiles awaken to the fact that over 50 per cent. of the entire cost of maintenance of cars is due to bad roads, improperly maintained pavement, and, as General Bingham put it, to red tape, it will be time for them to dispense with the tape and to call upon the officials who are charged with the proper maintenance of streets and roads to do their duty or retire from office, in order that men of action may take their places. In the meantime, the presence of red tape in a governmental bureau is probably more effective to conceal graft than it is to facilitate work, and the mere fact that an office is incumbered with so much red tape that the men therein are prevented from doing their work is a sign that something is amiss, and history has proven that appropriations dissolve in the face of such propositions; but it cannot be said that the people get a return for the money that is levied upon them.

* * *

THOSE who advocate in a loud voice the building of good roads seem to confine their efforts to the mere building of roads, but when it comes to the matters involving the repairing and maintenance of these highways the great voices are silent and the roads fall into a wretched state of decay. The real question is, Do these advocates want good roads or are they looking for money? From the taxpayers' and the automobile users' point of view there is no sense in having good roads unless there is a proper system of maintenance so contrived and managed that the money invested in the making of good roads will be conserved by the maintenance thereof. As an illustration of the waste of public funds that cannot be tolerated much longer it is only necessary for the reader to travel on the Albany Post Road for a few miles out of New York, when he will discover that the road builder has been busy on maintenance work for upwards of two years with no better result than the obstruction of the narrow road by a traction engine and a stone roller. In the meantime the roads are so bad that the traction engine gets stuck in the mud, but we have not yet learned of any good that might have been derived by the expenditure of funds in this effort.

* * *

IT was only the other day that the Callan law was being reviewed by its author, who seems to harbor the impression that the law must have been a good one because he framed it, but he fails to appreciate the significance of the fact that this law was shot to pieces by the court and that it has so many imperfections in its make-up that even a one-day-old infant can legally drive an automobile if it so elects. We do not know who the "Senator" was afraid of, but he seems to have had an aversion to the framing of any automobile law that would compel the owners of automobiles to respect the rights of others, although workmen who make it a business to drive automobiles for others are compelled under this law to pay the cost of taking out a license, followed by an examination to show their fitness; but the funny part of it is that the examination as it is given to the average chauffeur would scarcely test the intellect of a scarecrow. That the automobile fraternity has had enough of the Callan law is a self-evident fact. That the public was ever infatuated with any of the provisions of this masterly piece of stupidity would be difficult to show.

* * *

WHEN side levers that are used in the sliding gears show that they are incapable of doing the work for which they are placed, and that they are fastened on to the shaft with nothing more than a screw, and if the automobiles so made are designated as 1912 products the man who buys one of them will know that the maker thereof has a poor appreciation of the value of truth, or that he is too stupid to be entitled to the patronage of any man of intelligence. In the meantime there is danger to the public in the operation of an automobile on the highways if the side levers are insecurely fixed to their shafts, and it is believed that the time will come when the law will take a hand on the side of safety in the building of automobiles if the makers thereof do the things that cannot be sanctioned on any fair count. There is a possibility that agents practice the art of delivering second-hand cars as new ones, and that they juggle the factory numbers with the idea of deceiving purchasers who might get the impression that an automobile must be a new one if it bears a high serial number. Fortunately for the automobile industry the examples of this sort that come to the Editor are relatively few, but they reflect discredit upon the automobile industry and they hurt, perhaps more than anyone else, the men who represent fair dealing. There should be some way to snub these flagrant violations of common decency, and the makers themselves should regulate such matters rather than have the right to do so taken out of their hands by legislative bodies.

Savannah Gets Blue Ribbon Events

Grand Prize, Vanderbilt and Small-Car Races

After much discussion it has been finally decided to award to Savannah the premier events of the American racing year. On Monday, November 27, the Vanderbilt, Tiedeman Cup and Savannah Trophy races will be run simultaneously over the 17-mile course, and on the following Thursday, Thanksgiving Day, the battle for the Grand Prize honors will take place.

THE uncertainty which has existed for some time as to the time and place for the running of this year's Vanderbilt and Grand Prize races was set at rest yesterday by the announcement that the first-named classic would be decided over the Savannah course on Monday, November 27, and that the latter event would be fought to a conclusion over the same course on Thanksgiving Day, November 30. Concurrently with the Vanderbilt Cup race will be decided the fight for the Tiedeman Cup and the contest for the Savannah Challenge Trophy.

The Savannah course, slightly altered from last year, is approximately 17 miles in length. The conditions of the Vanderbilt race call for 17 circuits of the course—about 289 miles; the Savannah Trophy event, 15 laps, and the Tiedeman Cup race, 10 laps. In the battle for the honors in the Grand Prize race the contestants will be compelled to encircle the course 24 times—approximately 408 miles.

The race for the Tiedeman Cup will be a stock car event, open to cars of 161-230 cubic inches piston displacement. For the Savannah Trophy event stock cars of 231-300 cubic inches piston displacement will be eligible.

The entry blank for the Grand Prize race is quite comprehensive. Among the rights reserved by the promoting organization is that of ordering an elimination trial in the event of the number of entries being too large for safety, considering the length of the course. American and foreign cars are eligible to compete, though not more than three cars of any one make can be entered. Foreign entries must be made through the recognized automobile club of the country in which the car is manufactured.

The entrance fee for one car is $1,000; two cars of the same make, $1,500; three cars of the same make, $1,750. Entries close November 15 with William B. Stillwell, care of the Savannah Automobile Club, Savannah, Ga.

Blazing the Way to the South

WASHINGTON, D. C., July 17—One of the worst highways in this country is about to be taken in hand and in order to stimulate interest among the townships en route from Washington to Richmond, Va., under the co-operation of the office of Public Roads, the Association of Highway Improvement and the Touring Club of America, three automobiles will leave here on Monday next, July 24, carrying Paul D. Sargent, acting director of the office of Public Roads; J. E. Pennypacker, secretary of the Association of Highway Improvement, and Leroy Mark, vice-president of the Washington branch of the Touring Club of America. Henry MacNair, editor of the Blue Book, will act as pilot to the party. Meetings will be held along the line at the various stopping places. The road at the present time from the capital to Richmond is 179 miles, which would be considerably shorter were it not for the numerous detours that have to be made. Richmond has been chosen as the scene of the first National Highway Conference, which will be held in October of this year.

Overlapping Shows Will Crowd Metropolis

The selection by the National Association of Automobile Manufacturers, Inc., of January 10th to 17th as the dates of its show at the Grand Central Palace, and the combining of passenger and commercial vehicles in one show, will assure New York a full representation of automobile enthusiasts during the weeks in question. The Garden show opens on January 6th and closes on January 20th. The dates of the National Association show will, therefore, coincide with the last four days of the first week and the first three days of the second week of the Garden show.

It was not the intention of the National Association to ask the Motor & Accessory Manufacturers to participate, because it felt that its members would have enough to attend to with the Garden show. The Motor & Accessory Manufacturers soon made it plain, however, that it would expect to be admitted, and on Friday last arrangements to that end were completed. The Motor & Accessory Manufacturers will occupy 20,000 square feet of space on one of the upper floors.

M. C. A. to Meet in Detroit August 10-11

At the annual meeting of the Manufacturers' Contest Association, which will be held in Detroit, August 10 and 11, one of the most important matters to come up for discussion will be the establishment of a new method for determining the weight limits in stock car events. Various other interesting subjects will be considered, among them the important matter of regulating competitions held on half-mile and one-mile tracks which were built originally for other than automobile contests. The association membership roll now includes 91 members.

Guttenberg Races to Be Run July 22

Inability to get the track in condition in time, coupled with the failure of several racing stars to send in their entries owing to previous engagements, induced the promoter of the race meet scheduled for Guttenberg track on Saturday, July 15, to ask for a postponement of one week. The request was granted by the Contest Board, and the races will be run off on Saturday, July 22. Entries have been received of Mercer, Simplex, E-M-F, Overland, Lancia, Baby Regal, Correja, Schacht, Marmon, National, Mercedes, Abbott-Detroit, Pope-Hartford, Pullman and Buick cars.

Brighton Beach 24-Hour Race Postponed

Having found it impossible to secure ten entries for the 24-hour race scheduled for Brighton Beach track on August 4, Promoter Moross has announced the postponement of the event till September 2 and 4, when an attempt will be made to feature it as a wind-up to that meeting. If this is found inexpedient the long race will be still further postponed.

Chicago Orphans' Outing

The four automobile organizations of the Windy City, donating 173 cars, unite in entertaining over 1300 little ones and 100 inmates from the Home for the Aged with a 30-mile ride over the breezy boulevards of the Western metropolis, with occasional stops in the parks for refreshments.

CHICAGO, July 17—Local motorists gave the orphans and old people their annual ride Friday, when more than 1,300 children and 100 from the homes for the aged were taken out by the four local organizations, the Chicago Automobile Trade Association, the Chicago Motor Truck Association, the Chicago Motor Club and the Chicago Automobile Club. Chicago holds its outings later than other cities in order to be sure of the weather, and the wisdom of this course was apparent yesterday. No. long stops were made at any of the summer parks. Instead the old people and children were put into 160 pleasure cars and thirteen trucks and taken for a ride over the boulevards. They went north first and a stop was made in Lincoln Park, where ice cream cones were handed out to everybody. Then the cars headed south and swinging through the two big parks stopped at the German building in Jackson Park, where more ice cream cones were handed out, after which the parade disbanded.

In all the cars were out 3 hours, in which time they covered something like 30 miles. No mishaps marred the afternoon and the children and old people all had a good time. It is a matter of note that all the children and old people were cared for, there being fourteen local institutions represented in the run. More than enough cars were provided. It was discovered that some of the institutions, evidently anxious that none of the children be overlooked, reported they had more than they really had. One instance noted was where 175 children had been reported, whereas there were only 125 when the cars called.

Credit for the outing belongs chiefly to Dr. H. A. Gunther and John H. Kelly, chairman and secretary respectively of the joint committee representing the four organizations, who worked night and day for a week to complete the arrangements.

Quakers in Row with Mayor Over Fairmount Park Race

PHILADELPHIA, July 17—Owing to Mayor Reyburn's antagonism to the Quaker City Motor Club and his announced dissatisfaction with the organization's management of the Eastern classic last year, vigorous competition for the honor of conducting the fourth annual 200-mile Fairmount Park road race has developed, and although the Quaker City Motor Club has secured the sanction, the Philadelphia Automobile Trade Association put in a formal application to the Fairmount Park Commission at its monthly meeting yesterday for permission to hold the race. Owing to the fact that the contest cannot be held without adequate police protection, which of course would not be granted the Quaker City Motor Club in case the Mayor should persist in his opposition to the club, the automobile fraternity is up in the air as to the ultimate outcome. Despite Mayor Reyburn's indorsement of the Philadelphia Automobile Trade Association, members of the Quaker City Motor Club feel sanguine and are confident that the misunderstanding engendered between the Mayor and the club last year over the distribution of the receipts will be adjusted satisfactorily to their organization, the necessary police protection afforded, and the event conducted as in the past. The Q. C. M. C. is already armed with a permit from the Park Commissioners, in addition to the official sanction of the automobile governing body. Less than three months off, interest is already rife over the big event and a final decision from the city's chief executive is eagerly awaited.

Saturday, October 7, is the scheduled date for the race.

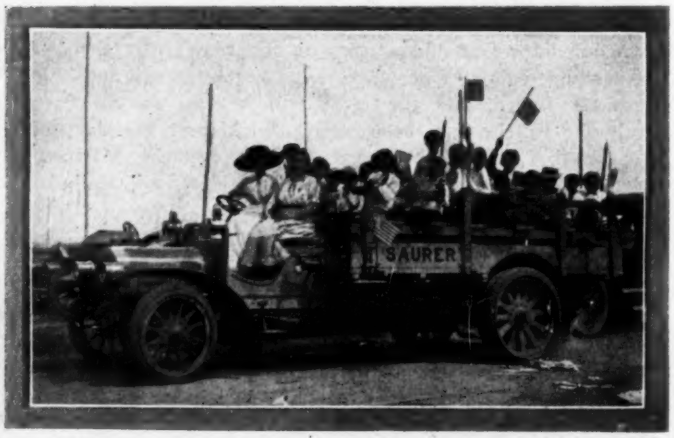


Fig. 1.—One of the Saurer trucks in the Chicago Orphans' Day outing, which carried more than a score of comfortably-seated children

Planning Trans-State Highway in Texas

GALVESTON, TEXAS, July 17—For the purpose of looking over and ascertaining the best route for the proposed highway from the northern boundary of Texas across the State to the Gulf of Mexico, a party occupying three automobiles left the Red River on July 10 for Galveston. The general idea is to construct across Texas from the Red River to Galveston a splendid highway, and then to encourage the adjacent counties to build good roads to connect with this highway.

Good Roads Train to Tour Virginia

RICHMOND, VA., July 17—Automobilists throughout the State are gratified over the announcement of the Southern Railway that the good roads train of that system will tour the State. This train, which has just completed a tour of Alabama, Mississippi and Tennessee, has just entered North Carolina, and after traversing that State will come into Virginia, and will be here in Richmond on October 30-31 and November 1, at which time the National Good Roads Association will be in session here.

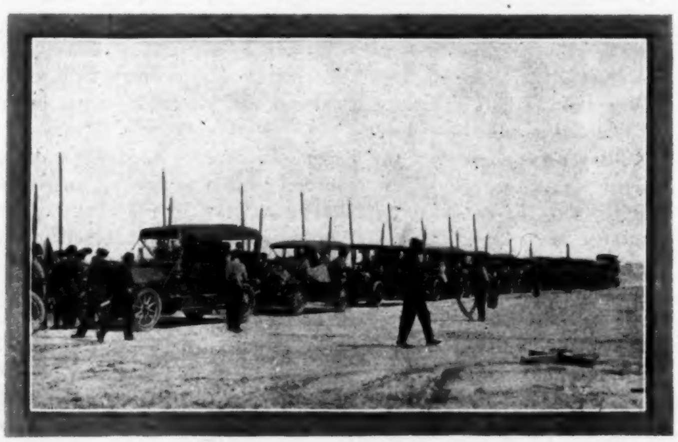


Fig. 2—Line-up of automobiles that took place in the event—there were over one hundred and seventy of them in the affair

The good roads train is composed of three exhibition cars. Daily lectures are given by expert road men, illustrated with stereopticon views, charts and maps, showing the progress of good roads movement throughout the South.

Ohio Second in Automobile Registrations

According to figures given out by the State Automobile Department, Ohio ranks next to New York in the number of automobiles owned and registered. Ohio now has 40,131 machines and New York 69,000. Pennsylvania trails along with about 39,000, with Illinois and Indiana a tie for the fourth place with about 35,000 each.

Seventeen Entries So Far for Elgin Races

CHICAGO, July 17—With seventeen entries actually in for the American Automobile Association's national stock chassis road races on August 25-26, the Chicago Motor Club and the Elgin Automobile Road Race Association believe they will gather a field that will be larger than the one that went to the tape last year.

Entries of four Nationals and a Corbin were received Saturday, while to-day's mail brought in three Alcos. Besides these, the entries of three Falcars, as many Staver-Chicagos, two Coles and a Lozier had already been received.

The following trophies are offered for competition on August 25: Fox River Trophy, for stock chassis, 161 to 230 cubic inches piston displacement, minimum weight 1,200 pounds. Distance 137 miles. Kane County Trophy, for stock chassis, 231 to 300 cubic inches, minimum weight 1,500 pounds. Distance, 170 miles. Illinois Trophy, for stock chassis, 301 to 450 cubic inches, minimum weight 1,800 pounds. Distance 202 miles.

Fig. 3—Chicago orphans leaving Lincoln Park, where thirteen hundred kids enjoyed their first treat of ice-cream cones

The big event, for the Elgin National Trophy, valued at more than $3,500, will take place on the following day, August 26, and as this event is open to stock chassis of under 600 cubic-inch displacement it is therefore open to those cars which will have competed in the three events on the previous day. In addition to the four handsome silver trophies big cash prizes will be awarded the successful drivers.

So far as the course is concerned, there is little left to do. Oiling has been going on for a week now and within the next few days the circuit will be inspected for faults that will be remedied before practice begins if any are discovered. The course has been very much improved and considerably widened, especially in the home stretch and at the turns. The bad Udina Turn has been widened until it is now 100 feet across.

1912 models will be eligible for the events provided stock certificates of descriptions are filed with the Contest Board on or before July 27 and are accepted by the Technical Committee, who will have charge of the technical affairs at Elgin.

Booming Des Moines as an Automobile Center

DES MOINES, IOWA, July 17—"Make Des Moines the automobile distributing center of the West." This was the keynote of a big banquet participated in at the Hyperion Field and Motor Club Friday night when prizes and cups won in that club's "Little Glidden tour" were presented. W. E. Moyer, pathfinder for the tour and the man whose efforts are largely responsible for the tour, sounded the keynote and the sixty automobile men who were present enthusiastically pledged themselves to do their best to bring his prediction to pass.

Fig. 4—Chicagoans stopped, looked and listened wherever the orphans' merry army passed on its way

Fourteen cups which were won in the four-day, 450-mile endurance contest were presented by Earl Butler, referee of the contest.

D. S. Kruidneir, Des Moines agent for the Cadillac, drew the sweepstakes trophy, his car having finished without a penalty in either the road or technical tests. All three of the Des Moines daily newspapers presented cups.

Automobilists of Iowa are to meet in Des Moines this week, July 20, in an attempt to form a closer State organization to promote the interests of good roads. The meeting is called by H. B. Groves, vice-president of the Iowa Automobile Club, and practically every auto club in the State has been asked to send representatives. It is thought that several hundred will attend.

Although there is a big automobile show to be held at the Iowa State fair, the last week in August, Des Moines automobile dealers are already beginning to lay their plans for the third annual show of the Des Moines Automobile Dealers' Association which is to be held at the Coliseum next Spring. It is likely that the affair will be pulled off the middle of March, although no definite dates have yet been fixed. W. E. Moyer and C. G. Van Vliet, who managed the 1911 show, will in all probability be in charge.

Cost of South Bend Auto Patrol Wagon

SOUTH BEND, Ind., July 16—At the request of the city administration Wilson E. Snyder, clerk of the Board of Public Safety, has prepared figures on the comparative cost of the auto patrol, which was placed in commission six months ago. During the six months it has been in use 1,010 arrests have been made and 2,504 miles covered. In the 12 months of 1909 there were 1,651 arrests and 2,927 miles covered by the horse-drawn patrol. The investment in horse and wagons and paraphernalia in 1909 was put at $1,527, and the interest on the investment at 6 per cent., with the cost of operating for the year was $1,101.80. In contrast is put the cost of operating the auto patrol for six months. Included in the figures is the cost for 27 days of last December. Investment, $4,831.50; interest on the investment at 6 per cent. for six months, $144.94; supplies, $27.85; lubricating oil, $21.25; hard grease, $6.75; gasoline, $59.36; repairs, $37.26; total for six months, $297.41. Estimated cost for operating for one year, $594.82. Cost per mile run under the old system, 37 1-2 cents; with auto patrol, 12 cents.

Doyle Joins the Timken Force

P. W. Doyle has severed his connection with the Long Manufacturing Company and on August 1 will join the sales department of the Timken Roller Bearing Company, of Canton, Ohio, and the Timken Detroit Axle Company, of Detroit, Michigan.

Cleveland Reliability Starts in Heavy Rain

CLEVELAND, O., July 18—With the sky black with clouds and in a pouring rain the 40 cars entered in the Cleveland *News* three-day reliability run left the Hollenden Hotel this morning promptly on schedule time. Many thought that because of the down-pour of rain the run would be postponed, but as all the contestants were willing to start the leader was sent away on time, the remaining entrants starting at three-minute intervals.

Mrs. Fred. C. Wood, the only woman driver in the run, laughed at the rain and started out with a seven-passenger Oldsmobile as a non-contestant. She carried her husband, two other men and two women and was given a great ovation as she pulled out.

Because of the rain that had fallen almost continually in the last 20 hours the drivers have had great difficulty in making the run on schedule time. Though the best roads were picked out for the route the rain has played havoc with more than one of them.

After plowing through mud and climbing rough hills the contestants arrived at Youngstown shortly before noon and were greeted by a great crowd that had gathered in the square. The stop marked the completion of the first 68 miles of the 533-mile trip. With the exception of a few punctures all the cars participating in the run went through without a breakdown of any sort.

The rain which had been falling in torrents let up during the morning and although the roads were very muddy and a number of drivers were obliged to put chains on their wheels, good time was made.

Farmers and their families greeted the contestants from every doorstep on the way, and at Chagrin Falls, Warren and Niles the citizens that had gathered in the town streets cheered the cars as they passed.

Tired, hungry, dirty, but enthusiastic, the contestants pulled into Wheeling Monday night completing the first day's run, which was equal to 212 miles.

With new supplies of gasoline and oil the contestants checked out of Wheeling, W. Va., at 7:30 in the morning, Tuesday, the second day of the tour.

At one o'clock Tuesday afternoon 25 of the contestants checked in at Zanesville. The van of the tourists reached Newark at 4 p. m.

Following is a list of the contesting cars:

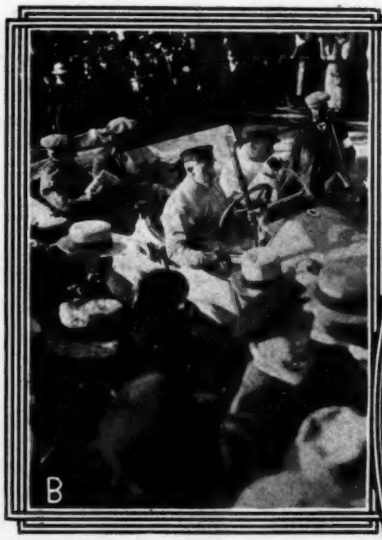
No.	Car.	Driver.
1	Columbia	C. H. Tyler
2	Maxwell	C. G. Bleasdale
3	Velie	D. W. Iseminger
4	Velie	Harry L. Lance
5	Oldsmobile	Andy Auble
6	Oakland	Fred Krum
7	Cadillac	Tom Swan
8	Krit	John Rauch
9	Brush	E. McCoy
10	Firestone-Columbus	Harry Kortz
11	Garford	Ira Fouche
12	Buick	F. B. Smith
13	Jackson	C. D. Paxson
14	Regal	L. B. Moore
15	Regal	G. P. Sperry
16	Marmon	J. H. Greenwald
17	DeTamble	H. W. Orndorf
18	Abbott	R. E. McClellan
19	Peerless	T. S. Hammer
20	Bergdoll	F. A. Kaiser
21	Oakland	H. Bauer
22	Everett	J. Gardham
23	Stuyvesant	P. H. Brown
26	Cartercar	V. R. Hall
27	Krit	H. Higginbotham
28	Lion	H. Bloomstron
29	Norwalk	F. Taylor
30	Norwalk	T. J. Ruffel
31	Ford	F. E. Van Paton
32	Ford	A. H. Smith
33	Ford	H. J. Lytle
34	Mitchell	E. C. Lucas
35	American	C. Kagy
36	Van Dyke	F. J. Monsette
37	Reo	A. G. Bredbeck
38	Maxwell	G. A. Roberts

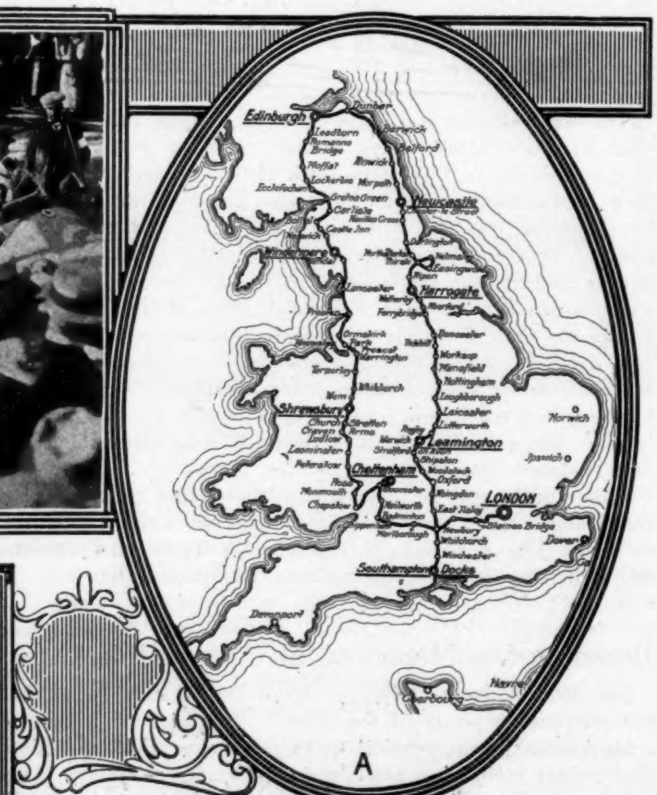
Albion and Vaterland Tour Together

By the time that these lines appear in print the Prince Henry Trophy Tour will have been completed, and what is known as the Coronation Tour will have added another event to the history of the automobile movement. There was no attempt at a race this year, and the trade element was done away with, as the cars were identified by the names of their owners and not by the official name of the car.

WITH rumors of strife on the one hand the Teutons and Britishers have been mingling together in automobiles vying with each other for the supremacy of the road. The Prince Henry of Prussia Trophy is this year being competed for by members of the Imperial Automobile Club of Germany and the Royal Automobile Club of Great Britain and is a tour pure and simple. There is no semblance of a race and the cup is to become the property of a club and not an individual. In other words, it is an inter-club run over two kingdoms, the participants necessarily being members of either of the aforementioned clubs. Penalties will be inflicted for time delays at the rate of one mark for every five minutes. The replacement of a spare part necessitates the loss of 12 marks for every part replaced. Additional gasoline that may be required during the day after the start will be counted as a mechanical stop, but 30 minutes are allowed before the start for lubrication and replenishments and adjustments, after which the hoods will be sealed. The cars must be fully equipped with wind shields, tops and speedometers, and the regulations call for special regulations regarding body work in order to compell the entrants to use recognized patterns.

The German team entries total 42 while those from Great Britain number 30. The cars are entered by individuals and to eliminate the trade element the names of the cars are with-





A—Map of Great Britain, showing the route covered by the participants in the Prince Henry tour

B—Prince Henry of Prussia, driving his own car, starting the tour at Homburg

C—Duke of Connaught's car at the start of the tour

held from official publication. Army and naval officers of the respective nations will act as observers on the cars.

The illustrations depict the scenes at the start, the first car to leave being that of Prince Henry, with the Prince at the wheel. Homburg was chosen as the starting point and it will be remembered that this has been the venue for several memorable speed races including the Gordon Bennett, when the French wrested the blue ribbon of the road from their German "friends" who had won it the year previous from the British over the roads of the Emerald Isle.

The old Gordon-Bennett course was followed as far as Königstein where the route bears due north as far as Leun, and afterwards follows the course of the river Lahn as far as Limburg, whence the road leads via Montabur to Coblenz. From Coblenz to Cologne, and from Cologne to Wesel, the course of the Rhine was followed, but from Wesel the route takes an easterly direction to Münster, famed for its old Rathhaus and plethora of churches, thus avoiding the Dutch frontier.

Cologne was the stopping-place on the night of Wednesday, July 5th, and the cars halted at Münster on the night of Thursday, July 6th. From Münster the direct route leads to Bremerhaven, on the mouth of the Weser, where the vehicles were taken on board a steamer specially chartered for the purpose of their conveyance to Southampton. On the night of Friday, July 7th, competitors slept on board, and also on the Saturday night; the steamer arriving in port on Sunday, July 9th. On the following day, Monday 10th, a start was made from Southampton due north through Winchester, Whitchurch, Oxford, and Stratford-on-Avon to Leamington, this being the first stop on English soil. From Leamington, still traveling north, the manufacturing towns of Leicester, Nottingham, Worksop, and the racing centre of Doncaster were taken *en route* to the famous inland watering town of Harrogate. Here the competitors stopped over Tuesday night, July 11th.

Leaving Harrogate, a detour was made through Thirsk, Helmsley and Easingwold in the Yorkshire moors before proceeding on the main road through Northallerton and Darlington to Newcastle-on-Tyne, the engineering centre of the north. Still following the Great North Road the cars passed over the Scottish border on Thursday, July 13th, and reached Edinburgh that night. Here, also, the competitors stayed over the whole of Friday, July 14th.

Edinburgh is the northernmost point on the route, so that on Saturday, July 15th, the southward journey commenced; its immediate destination was Windermere, Saturday night and the whole of Sunday, July 16th, was spent in the Lake District, and on Monday the two clubs continued to travel due south as far as Shrewsbury, where the night of Monday, July 17th, was spent. Having thus traversed the north-eastern border of Wales, the route continues due south through Ross and Chepstow, and then follows the banks of the Severn through Gloucester to Cheltenham, which was the destination on Tuesday, July 18th, and the last night away from home. From Cheltenham the route goes for a short distance due south in order to strike the Bath road at Chippenham, and then turns due east along this famous old coaching highway. The completion of the run was the occasion of a banquet at the Royal Automobile Club on Wednesday evening, July 19th.

Twenty-six Contestants in Wisconsin Tour

MILWAUKEE, WIS., July 17—Twenty-six cars left Milwaukee this morning on a trip of practically 1,000 miles, the result to determine the awards by the Wisconsin State A. A. of four trophies donated to the organization by newspapers and individuals interested in motoring and the promotion of sportsmanship. It is the second annual reliability tour of the Wisconsin State A. A., the first being held from July 18 to 23, 1910. Emil Hokanson, whose car won the only trophy offered in 1910, by making a perfect score, is defending his honors in another Buick, a 1911 model.

The contestants in the trade or professional division are: Cadillac, three Buicks, two Imperials, Reo, Ford, Krit, Case, National, Overland, Franklin, Regal, Warren-Detroit and Petrel.

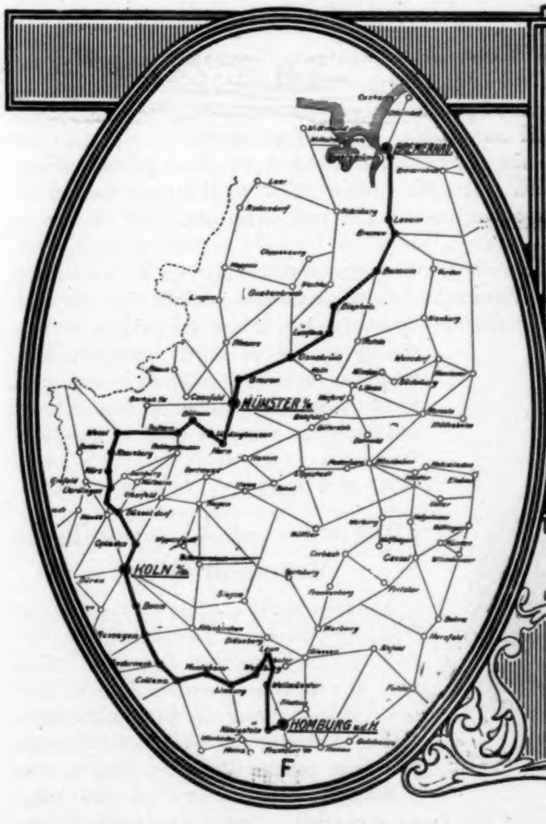
There are nine roadsters and seven touring cars in the trade class and two roadsters and two touring cars in the private class.

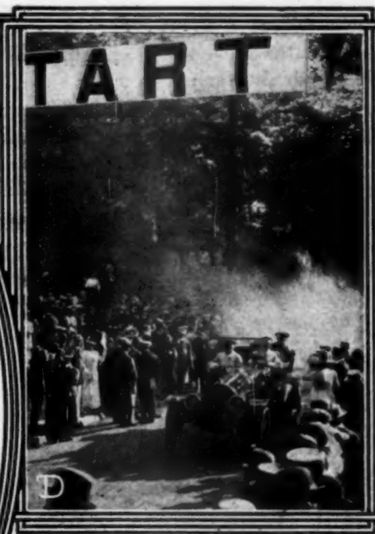
There are eight official cars, as follows: The official Kissel Press car; pilot, Overland, 53; confetti car, White Gas, 40; general press, Rambler, 63; pacemaker, Cadillac; technical car, Case; secretary's car, Palmer-Singer; physician's car, Buick, 21.

Premier Tourists Pass Through Omaha

OMAHA, NEB., July 17—The Philadelphia tourists in Premier cars who are touring across the country were in Omaha from Monday evening to Wednesday morning, July 12. Coming through Iowa they found it fine going, until a heavy rain on Sunday made the progress considerably slower. In Omaha they purchased a camping outfit, and they expect to camp out overnight many times while they are in the mountains. There were still twelve automobiles and thirty-eight tourists in the party.

Some of them expressed mild surprise at not seeing the Indians running loose in Nebraska.





D—Spectators witnessing the start of the Prince Henry tour

E—Prince Henry of Prussia in conversation with the president of the Imperial Motor Club of Germany before the start

F—Map of the part of Germany covered by the tourists being divided into three stages

Wisconsin's New Law Goes in Effect Aug. 1

MILWAUKEE, WIS., July 17—The Wisconsin Legislature has passed the consolidated motor-car bill and it has received the signature of Governor McGovern. The chief changes are as follows:

Annual registration, instead of present perpetual registration while car registered is in the hands of its then owner.

Annual fee of $5.00 for registration. Present fee is $2.00 for perpetual license. Proposition to tax by horsepower turned down.

Two licenses must be carried, front and rear. Only one necessary heretofore. The tags are furnished free upon payment of registration fee.

Red tail light must be carried in addition to one light on front as at present.

Speed limit in cities changed from 12 miles per hour to 15 miles per hour; in country, 25 miles per hour as at present. Proviso is included that no greater speed shall be used anywhere than is safe under the circumstances and conditions.

No person under 16 years of age may operate a motor vehicle, unless accompanied by a responsible adult.

Each city and village clerk must keep an up-to-date list of motor car and cycle owners, in booklet form, to be furnished by the Secretary of State and to be accessible to free inspection during business hours.

After paying the expenses of the department of the Secretary of State's office which attends to the registration work, three-fourths of the money accruing from the registration fee collection shall be transferred to county treasurers to be used in the repair of country highways, and the remaining one-fourth shall be used to augment the State highways fund.

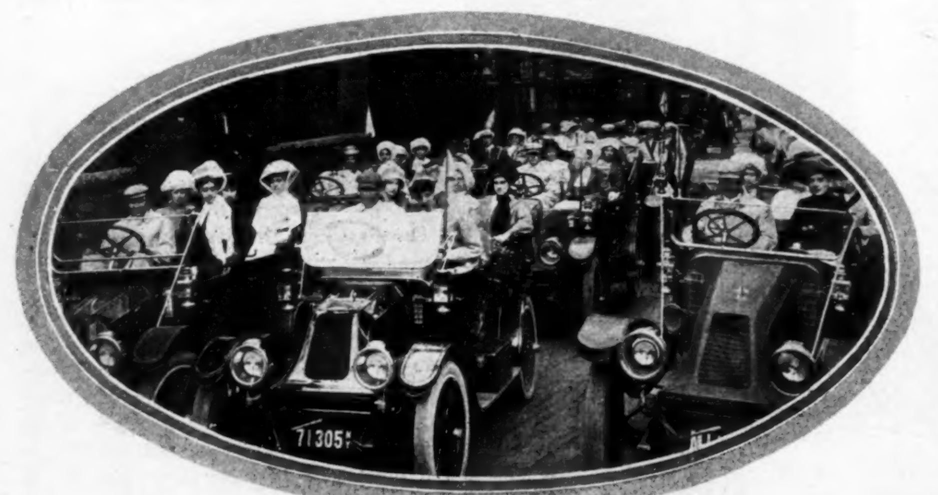
A second offense against speed regulations shall be punishable by fine of $25 to $100, or imprisonment in jail not more than 60 days, or by both fine and imprisonment, at the discretion of the court.

No city, village, county, town, park board or other local authority shall have the power to pass any law or regulation interfering with or contrary to the State law.

Manufacturers are to have assigned to their testers a distinguishing number or letter, and this number or letter must be used whenever factory cars are driven on streets or highways of the State.

Any driver inflicting an injury to any person must stop and offer assistance and must always give name and address if requested. Failure to do either lays the offender liable to a fine of not more than $100 or imprisonment for a term of not more than three months.

The new law goes into effect August 1. While present licenses are good until January 1, 1912, all cars registered after August 1 come within the new law and a fee of $5 must be paid.



Women employees of the Franklin Automobile Company starting on their annual outing to Pleasant Point, on Lake Ontario

Winnipeg's Show Is Quickening Trade

WINNIPEG, July 15, 1911—Western Canada is being saturated with information relative to the automobile, its efficiency and field, in this new country. The occasion is the second automobile show to be held in the West of the dominion and it is being held in connection with the twenty-first annual Winnipeg Industrial Exhibition. The machines of approximately seventy-five factories of United States and Canada occupy 40,000 feet of floor space in the manufacturers' building at the fair.

As an opportunity for meeting the successful townsmen and farmers of Western Canada the fair is without any equal. It draws from fifty to sixty thousand outside residents every year. During May the directors decided that the inception of an automobile exhibit might interest its patrons. The notice was published and within a week the 20,000 feet allotted was subscribed by agencies and manufacturers. A further allotment was made and entered for and ultimately the directors had to rush up a wing of 10,000 feet to hold the over-flow.

Since the opening day of the fair the automobile show has been the biggest feature of the exhibits. In all uncovered territory to the west agents are being appointed at the grounds and in addition hundreds of prospective purchasers are being listed. The local automobile and supply men state that the show is the best thing which has been held in the interests of the automobile in the west, exceeding even the winter show under the auspices of the Motor Trades Association.

Among the cars shown are the Chalmers, Mitchell, National, Ford, Buick, Packard, Overland, Hupp-Yeats, McFarlan, Inter-State, Republic, Shackt, E.M.F., Halladay, Hudson, Knox, Columbia, Maxwell, Patterson, Gramm trucks, Everitt "30," Paige-Detroit, Henry, Marathon, White, Warren, Brush, Gopher truck, Russell, Waverly, Olds, Reo, Detroit-Electric, Winton, Case, Speedwell, K-R-I-T, Hupmobile, Kissel, Empire and several others. In addition to these displays, dealers in accessories and supplies occupy several stands.

New Use for the Automobile

During the recent heated spell in New York City in which over a thousand horses were incapacitated, several members of the New York Woman's League for Animals patrolled the hot streets in their automobiles in readiness to see that proper care was given to the beasts and that no overloading of the vehicles drawn by them was taking place. Due to the activities of this branch of the society, several arrests were made and convictions secured.

This league, which is doing remarkably good work, was formerly the Woman's Auxiliary to the Society for the Prevention of Cruelty to Animals, but since the object of the society is not so much correctional as to come in more intimate touch with those who own animals for pets or otherwise, a separate society has been formed.

150 Owners of Automobiles in Bozeman, Mont.

A considerable number of the most influential owners of automobiles in Gallatin County around Bozeman, Montana, are having meetings for the purpose of organizing an automobile owners' association, and Charles E. Dunlop, secretary of the Bozeman Chamber of Commerce, is authority for the statement that there are 150 automobile owners in that county, and that they are all in favor of a virile organization devoted to the interest of automobile owners.

The Week's Doings in Detroit

DETROIT, MICH., July 17—Continued interest in long trips by motor trucks is noted locally. The Van Dyke delivery wagon which led the Affiliation tourists over the 800 miles of their run has been sent to Cleveland to take part in the Cleveland *News* run. The Saurer trans-continental truck passed through Detroit several days ago on its return trip to New York. Local manufacturers of trucks and wagons are almost daily sending their cars out into the country on trial trips. In addition, many of them are using factory-owned cars as demonstrators for local merchants' use. It has become generally recognized that the most effective form of salesmanship is found in this method. Rarely does it occur that a merchant consents to a demonstration of this character, without following the demonstration with an order for cars. The presence of the factories in Detroit has made demonstrations of this sort particularly applicable to the local situation and there is a marked increase in the number of delivery wagons and trucks, in active use this season, on the downtown streets.

One of the busiest factories in Detroit just now is that of the Brush Runabout Co. It is declared that contracts for the new Liberty-Brush have been closed during the past two weeks at an average of faster than 100 a day. The factory is producing 80 a day and this week started a night shift which will endeavor to keep up with the orders which the firm is receiving for the new car. The company is now engaged in the tabulation of a remarkable economy contest, conducted July 4 among its dealers all over the country.

James T. Shaw, treasurer of General Motors Co., is back in Detroit, after a two-weeks' tour in which he gave the company's new Welch-Detroit car a thorough test. Mr. Shaw made several detours in search of strenuous hill-climbing tests and found the car equal to everything asked of it.

The younger manufacturing firms still continue to find difficulty in securing representation, particularly in the smaller cities of the country. It is a generally admitted fact that there are fewer dealers in the country now and fewer additions this season than at any prior time in recent years. On the other hand, those dealers now in the business are virtually all of them well established and financially capable.

Detroit parts-makers and manufacturers of special machinery all feel the prosperity of the busy season and many of them are increasing their equipment. There will be several additions to their ranks next year, prominent among which will be the Henry & Wright ball-bearing drill press plant, which now has a building in process of erection near the plant of the Hudson Motor Car Co. The Cross Gear and Engine Co., 800 Bellevue avenue, has recently increased its capital stock from $20,000 to $80,000 and will materially enlarge the capacity of its plant.

The King Motor Car Co., which has 22 acres of land in the Jefferson avenue district and already has a factory building that is busy turning out cars, will soon break ground for an extensive addition. The firm has enlarged its orders for material and expects to build 3,000 cars of the 1912 model.

Stephens Heads Federal Rubber Co.'s Chicago Branch

CHICAGO, July 17—George W. Stephens, formerly manager of the American Tire & Rubber Company of Chicago, and at one time advertising manager for the G & J Tire Company of Indianapolis, has been appointed manager of the Chicago branch of the Federal Rubber Manufacturing Company of Cudahy, Wis.

Timely Hint for New England Tourists

The Touring Club of America suggests the following directions for avoiding the road construction between Pittsfield and Albany:

Mileage

0.0 Start Berkshire Hills Branch T. C. A. Hotel Wendell, Pittsfield, proceed on Blue Book Route 337 to Shaker Village.
4.6 Turn left (big white house on right).
6.9 Pass cross-roads, cemetery on left.
8.1 Turn right on dirt road, bear right.
10.7 Pass cross-roads, straight ahead, bear right, mill pond on right.
11.5 Pass white church on right.
11.8 Turn sharp right, Queechy Lake on right.
13.3 Bear left continuing to
16.7 New Lebanon, turn left passing white church direct onto oiled State road to Albany—follow Blue Book Route 337.

Dorian Sales Force Reorganized

Mr. James T. Wallace has been made general sales manager of the Dorian Remountable Rim Company, with headquarters at 114 Liberty street, New York City. A. C. Marquardt will be Mr. Wallace's assistant. J. Franklin Duffy has been placed in charge of the Broadway office at No. 1804. The factory of the company has been removed to the Bush Terminal in Brooklyn.

Electricity for the Man Who Wants to Know

Among the books of recent issue our attention has been called to "Practical Applied Electricity," from the pen of David Penn Moreton, B.S., E.E., associate professor of electrical engineering at Armour Institute of Technology; press of Reilly & Britton Company, Chicago; 438 pages, including index, in flexible morocco, adequately illustrated and carefully compiled. The price of this book is $2, which is not too much to pay considering the fact that the whole range of electrical activities is brought within the narrow view of the reader who cannot afford the time it takes to obtain a substantial groundwork in technical literature. This book should be of value to the automobilist on account of the excellent information it gives in relation to batteries, and the fundamental principles of electricity, affording to the reader a clear understanding of the basic principles of every electrical device employed in automobile work. True, the book holds a wide measure of definite information that cannot be of great service to the mere owner of an automobile, but it is plainly put and it might prove of value as well as interesting to the owner of a car who will devote a little time to the reading of this handy volume.

Members of the Overland Club at the dedication of their new clubhouse on the shore of Lake Erie, Toledo, Ohio

New Things Among the Accessories

Combination Electric Ignition and Lighting System

THE Matchless electric lighting and ignition system for automobiles and motor boats, manufactured by the Esterline Company, Lafayette, Ind., possesses some very unique features.

The equipment comprises a positively driven, magneto-type, direct-current generator, a storage battery and an automatic, self-closing, low-voltage, release, overload, reverse current controller. The generator is made to connect directly to the pump shaft in the same manner as an ignition magneto, without the use of a speed governor or speed-controlling device. It is supplied with complete ignition equipment, which can be omitted if desired, so that the ignition magneto can be retained or dispensed with, as the user may desire. If desired, the generator may be driven by gears or a silent chain, in case the ignition equipment is not used.

The use of a permanent magnet generator is made possible by the unique electric controller which comprises a part of the system. The controller has four distinct functions, as follows:

(1) To connect the battery to the generator when the voltage of the generator has reached the point where it will charge the battery.

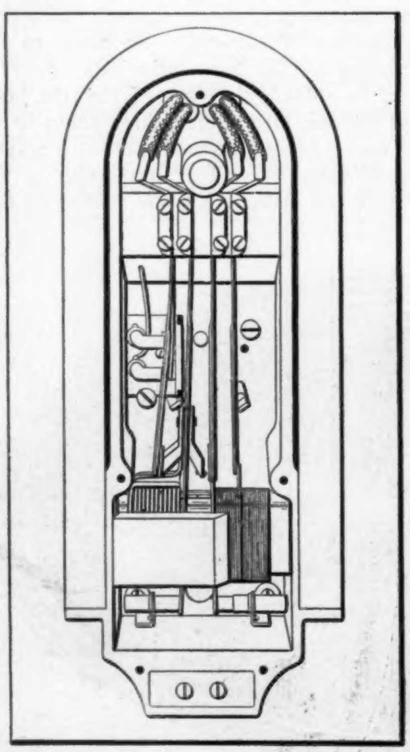


Fig. 1—Esterline automatic controller with cover plate removed, showing coils and method of supporting them

(2) To limit the current through the battery to the normal charging rate, when the generator is running at high speed.

(3) To disconnect the battery from the generator whenever the voltage of the generator is less than that of the battery.

(4) To prevent the connection of the battery to the generator when the car is driven backward.

The controller consists essentially of a

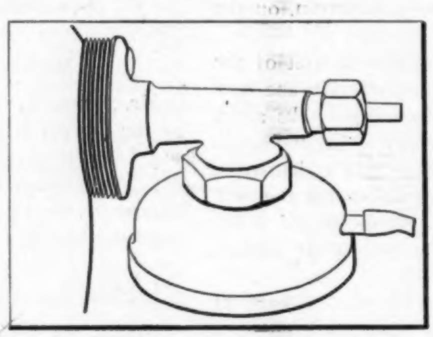


Fig. 2—Automatic pressure regulator on P. & B. acetylene gas-lighting system

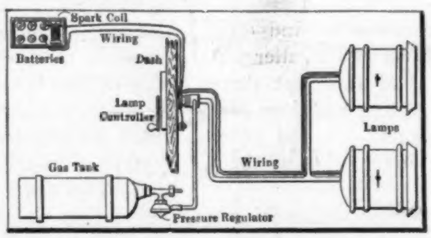


Fig. 3—Diagram of installing P. & B. illuminating scheme

die-cast metal case, over which is placed a permanent magnet, with pole pieces projecting into the case; a pair of coils surrounding the pole pieces, but capable of motion relatively to the pole pieces; a cover plate, which seals the case tightly, rendering it dust- and moisture-proof.

The force moving the coils is obtained by the reaction between the field of the magnet and the current in coils surrounding the projecting pole pieces.

All of the moving parts of the controller are mounted on phosphor bronze leaf springs, 1-2 inch wide, set rigidly in an insulating block.

The operation of the controller is such that all electrical circuits are opened and closed at the instant the current is zero. No current is drawn from the battery by the controlling apparatus.

With the car at rest or running at slow speed, the connection between the battery and the generator is open, but when the voltage of the generator becomes sufficient to charge the battery, the circuit between the battery and the generator is closed.

The space occupied by the controller on the dash is 2 1-2 inches x 6 inches, and it extends only 1 1-2 inches from the dash; the weight complete is 2 1-2 pounds. The metal case is water-proof, dust-proof and ornamental in appearance.

A four-point, back-connected switch is used, with the stem extending through the front of the controller case. There are four positions of the switch—lights off for day running, side and tail lamps for city streets and use while the car is standing at night, head and tail lights for touring and all lights on.

All wiring is on the engine side of the dash, where it is not exposed to view. Openings are provided in the front of the controller for plug connections to an exploring lamp for use in locating trouble, filling gasoline tank, etc.

The generators are made in two sizes; the smaller size has a capacity of 7 1-2 amperes continuously at 6 volts. The larger machine has a continuous capacity of 12 1-2 amperes at 6 volts.

The shaft is particularly heavy and rigid; the laminations of high-grade sheet steel are keyed to the shaft and the windings are imbedded in slots in the core.

The generator is made of sufficient capacity to carry its rated current without overheating and without the necessity of drawing in air and dust from the outside in order to keep it cool. It is geared or connected directly to the engine shaft or an intermediate shaft without any clutches, brakes or speed controlling devices.

An enclosed junction box is supplied with each equipment. This box is of sheet metal, with a removable cover, and contains a small insulated panel board, with provision for the necessary fuses for each circuit and connections for all wires.

An 80 ampere-hour battery is used with the small size and a 100 ampere-hour battery with the large size, and on account of the fact that it is impossible to overcharge a battery with this system any first-class storage battery can be used.

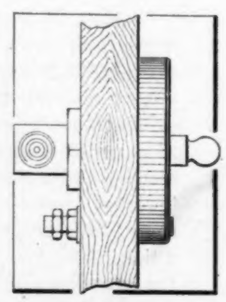


Fig. 4—Profile view of the P. & B. lamp controller

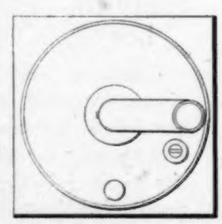


Fig. 5—Front view of controller for gas and spark

Automatic Light-Lighting System

IF evolution may be measured by the increasing speed of transportation facilities, this is only another way for saying that it may be measured by the general increasing tendency to automaticity. As technical developments progress, more and more work is taken off the hands of the operator of a device which is made to serve itself, in a way, thus producing in the mind of the operator a true picture of the agreeable situation termed simplicity. Automatic carburetion, lubrication and illumination are equally important steps in the developments of the modern automobile, the last named having taken no less labor in developing it than the other two.

Among up-to-date lighting systems acetylene is used widely for reason of its white light, which comes very near in intensity to the light of the sun. Its brilliancy is hardly approached by any other sort of artificial light, but this advantage has hitherto been coupled with the uncomfortable obligation of lighting the gas by means of a match, and with the further disadvantage of the driver being forced to regulate the outflowing stream of acetylene leaving the gas tank, since in course of time, as the gas is being used up, the initial pressure in the tank falls off very noticeably. The work of adjusting the nut of the tank, while it is not a hard one, is considered very uncomfortable by many automobilists, and it is just this class of motorists, whose number, by the way, is legion, that are ready to install on their cars a new system, doing away with the acts above described, especially if the price of the lighting system is not too high.

An automatic acetylene lighting system designed for the army of progressive automobilists is illustrated in Fig. 3, which shows the manner of laying out the connections for the gas as well as the low-tension current, leading from their respective sources to a controller on the dash and thence to the headlights. The system here shown consists of three special devices combined to advantage, which are the pressure regulator and the controller, in addition to which there is a special construction of igniter which is located in the headlight. The automatic pressure regulator is of the nature of an automatically adjusting valve through which the gas passes; and it is a feature of the regulator, which is seen in Fig. 2, that while the gas pressure in the tank may be up to 225 pounds per square inch, the acetylene after it has passed through the regulating device has a pressure of but 2 ounces per square inch, which is equal to the weight of a water column 3 inches in height.

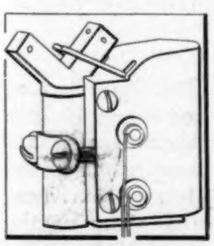


Fig. 6—Igniter incorporated in P. B. system

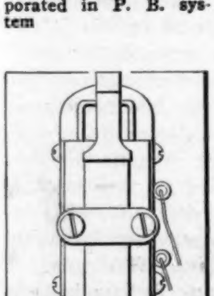


Fig. 7—Profile view of the acetylene igniter

In Figs. 4 and 5 is seen the lamp controller, both in full-face and in side view. The small key seen in the illustration indicates the only way by which the entire system is operated, in that it both serves to close the current, which enables the spark coil to produce a spark at the igniter in the lamp, and at the same time raises or lowers the gas flames by a regulating valve interposed in the gas lead at this place.

The igniter is of unique construction and securely fastened to the acetylene burner as shown in Figs. 6 and 7. The two wires leading from the battery and coil to this point of the system are connected to the two screws seen in the cut, and connection is made through the interior of the igniter to the two points forming a spark gap right above the center of the double burner. This arrangement is a guarantee that when the key on the dash is so turned as to permit the gas to flow to the burner, the current from the spark coil is closed at the same time, and a spark made to appear in the gap of the igniter wires, thu insuring positive and prompt ignition of the gas admitted from the tank to the headlights.

Fig. 8—Sanitary goggles are of little weight

The system is named Motor-Light Lighter, and is the product of the P. & B. Manufacturing Company, being made at the plant of that concern, which is situated at 376 Birnie Avenue, at Springfield, Mass.

Light and Sanitary Goggles

AMONG the drawbacks of touring, assuming the roads to be fair, there is none greater than the disagreeable sensation of a strong air current striking the eyes of driver and passenger, and while it is sometimes not a desirable course to shut out all the air by means of an erect windshield the eyes of the occupants should always be efficiently protected. Fig. 8 shows the latest accessory constructed to serve this purpose, viz., the sanitary goggle, which is made of one piece of transparent and colorless material that does not obstruct the work of the eyes in any way, while the lining is of a soft and strong fabric. The whole thing is comfortable and simple, and protects the nose as much as the eyes; furthermore, the price of the goggle is low owing to its simple construction. The Sanitary Sales Company, of Bradford, Pa., produce this novel device.

Fig. 9—Safety crank which is back-kick proof

Auto Safety Crank

ACCIDENTS owing to a back-firing motor are met with, at times, even by skilled drivers, and when the trouble and pain of a broken arm are vividly pictured in the mind, there will be hardly an automobilist to deny that an insurance against mishaps of this kind will be worth some expenditure, just as the majority of car owners do not hesitate a long time to take out a policy protecting them from loss in case of the car being damaged by fire. The illustration of the Auto Safety Crank which is offered herewith, represents the latest achievement along the line of back-kick insurance, and being of substantial construction and high-class material, it is sure to live as long as the automobile it is installed upon. The wax engraving shows the manner in which the device is attached to the front cross bar of the chassis frame, indicating the strength of the apparatus. This crank is made and sold by B. F. Perkins & Son, Inc., Holyoke, Mass.

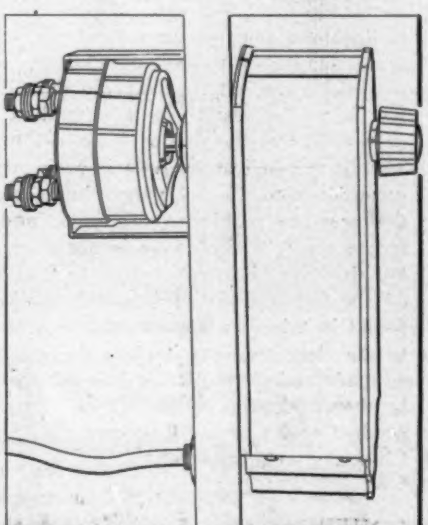


Fig. 10—Side view of Esterline automatic controller, with portion of dash cut away to show rear connected switch

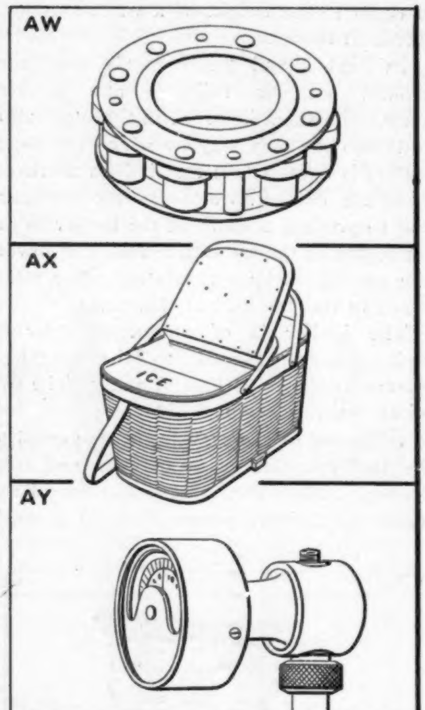
Seen in the Show Window

MATERIAL and workmanship of a high class together with up-to-date equipment are conditions which make the manufacture of strong and efficient bearings possible. The attention which engineers have paid to their constructions for not a few years, therefore, has not been exaggerated by any means, but the result of their endeavor has shown that the efforts made in this field duly paid for themselves. A good bearing, if it is well lubricated, outlives millions of revolutions of a shaft under heavy load. An illustration of a standard product is herewith afforded (AW), this being the Bower roller bearing, made by the Bower Roller Bearing Company, of Detroit, Mich.

EXCESSIVELY high temperature is hard on any man's system, but never does heat make itself more felt than when there are no cold drinks to counteract it. For the Summer time the Hawkeye refrigerator basket will be found useful for transporting food and water fresh and cool for a day. This enables the use of many dishes which otherwise would have to be done without. The basket shown at (AX) is made of strong, tough rattan, woven and bound to stand hard use. It is lined with nickel, which makes it sanitary and rustproof. An asbestos layer is placed between metal and fiber walls, insuring good thermal insulation, and very little ice is required to kept the temperature down. The Burlington Basket Company, 44 Main street, Burlington, Ia., is the maker.

AIR pressure in tires is an important factor in the cost of their use, and authorities hold that every driver ought to be equipped with an instrument for measuring tire pressure, since gauging the same by kicking the outer casing and then judging from the resistance is a method not even deserving the title of "rule-of-thumb." The Brown indicator (AY) is permanently screwed on to the tire valve, thus showing the pressure within at all times, and to inflate the tube the gauge is not removed, but the pump is connected up to the valve of the indicator. Comfort will surely be found in this arrangement, and in addition to the clear readings it gives the gauge is so made and installed that it is not harmed by the revolutions of the wheel. It is the product of the Brown Company, 1091 South Clinton street, Syracuse, N. Y.

THERE are several methods of repairing damaged tires by means of vulcanizers, and these differ mainly in the nature of the fuel, some using alcohol to produce the necessary heat and others electricity, while with a third type, applying steam for the purpose, it is claimed that overheating and consequent injury of the tire are positively avoided. As an example of this latter type the National steam vulcanizer is here illustrated (AZ), in which the water is heated in a miniature boiler by means of a small burner placed underneath it. In its shape this vulcanizer is rather conventional and, as the illustration shows, it is easily and securely attached to the tire. It is made and sold by the National Motor Supply Company, 1919 Euclid avenue, Cleveland, Ohio.



AW—Illustrating the Bower Roller Bearing, a standard product

AX—Hawkeye Refrigerator Basket keeps cool twenty-four hours

AY—Brown Pressure Indicator stays on tire for good

AZ—National steam type of vulcanizer may be securely attached

BA—Red Cross signal to be placed on physician's radiator filler cap

BB—Ajax revolvable door trunk for transporting reserve tires

UNWRITTEN laws will always command some consideration for the physician violating speed ordinances while on business bent, unless he seriously interfere with life or property of others in the pursuit of his duties. Nevertheless, a doctor who drives his own car will grant that he would preferably save his nervous energy for other purposes than to keep an anxious lookout for pedestrians on his way to a patient, when his mind is generally occupied with important matters. Therefore, a sign clearing the way for his car will be a good thing for a physician to place on his car in a conspicuous position; and this want is being filled by the Red Cross Radiator Ornament, placed on the market by the Motor Car Equipment Company, of 55 Warren street, New York. The cross, which is shown at (BA) is 3 inches high and 2 1-2 inches wide, finished in ormolu gold with either red or green enameled sides. The ornament will be recognized by everybody and very effectively secure the right of way.

RESERVE tires are frequently carried along by tourists, and it may be seen from the manner in which these tires are stored whether their owners belong to the class of careful automobilists or not. These powerful and yet sensitive shoes of the automobile, while they are able to withstand a great deal of strain if kept in good shape, will deteriorate most rapidly if exposed to moisture and sunlight for some time. The value of an efficient trunk for reserve tires is not to be underestimated, and among the several classes of casings the revolving door type is quite popular. An example of this kind of tire trunk is here shown (BB), the door of which revolves in a continuous steel channel, making the trunk perfectly rigid. This trunk is make by the Ajax Trunk & Sample Case Company, 91 Mercer street, New York, and may be fitted with an "Ajax Arch," for the transport of demountable rims.